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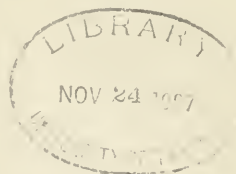
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PROCEEDINGS

OF THE



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FOURTH SERIES

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PROCEEDINGS
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VOL. XII, No. 1, pp. 1-26

JANUARY 2, 1923

I

**FIELD WORK AMONG THE BIRDS AND MAMMALS OF
THE NORTHERN COAST OF CALIFORNIA IN 1921**

BY JOSEPH MAILLIARD

Curator, Department of Ornithology and Mammalogy

Continuing the plan of investigating those parts of California of which the birds and smaller mammals are least known, Del Norte County was selected as the principal scene for the field work of the department of Ornithology and Mammalogy of the California Academy of Sciences in the spring of 1921.

On account of the utilization of the major portion of the departmental funds in the financing of the Academy expedition to the Gulf of California, the size of the field party for the northwest coast work was limited to two members, Mr. Chase Littlejohn, assistant curator, and the writer.

It was decided to maintain for a few weeks during migrations practically continuous observation in a given spot, and the village of Requa, Del Norte County (California), was selected as the principal station for this work. This little settlement is situated on the north bank of the Klamath River, about one-half mile above its mouth, and is perched upon a steep hillside overlooking the river at a ferry which has long been maintained there.

Although it would have been better to have arrived upon the scene in time to note the arrivals of the earlier north-bound migrants, it was not until April 19 that a start could be made.

Arcata was reached by rail that evening, and the next day the journey of something over 70 miles was made in a large and powerful auto stage, over roads that seemed at times impassable by reason of the deep ruts and treacherous mud resulting from heavy traffic during a long continued rainfall.

Most of the second day's journey was through dense forest, broken only here and there by clearings where the timber had been removed, or by sparsely occurring natural openings.

All the bird life noted on this day's journey was in these openings. Not a single bird of any sort was seen in the forest during the long hours of travel—often at a pace that was barely more than a crawl—on this gloomy, overcast day, while but few were seen anywhere. Western Robins, California Brewer Blackbirds, Northwestern Redwings, and Mendocino Song Sparrows constituted the bulk of those noted.

The forest along this coast is practically untouched over a large territory, being fortunately, as yet, inaccessible for profitable lumbering purposes. A great deal of it consists of magnificent redwood growth, and much of it is carpeted with large areas of ferns and mosses in almost tropical luxuriance, while great masses of rhododendron when in full bloom produce wonderful color effects as an offset to the somberness of the heavy shadows.

At times where the road skirted the shore, wave-washed, rocky islets would come into view, and all those that were large enough to rise above the reach of the battering seas had upon them flocks of Western Gulls. Several of these islets were so close to shore that the birds could be seen sitting on their nests. Some of these rocks appeared to be so precipitous as to be inaccessible to man, but probably could be landed upon by expert climbers at opportune moments, and in the vicinity of Trinidad several have been visited. As land birds only were to be considered on this field trip, no attempt was made by us to visit any of these rocks.

The party arrived at Requa at 4 P. M., April 20, having been about eight hours making the trip of 72 miles from Arcata. Mr. J. B. Mortsof, Indian agent in charge of the Hoopa Indian Agency and whose territory includes Requa, had very kindly given the Academy permission to use the roomy agency cottage here. The only other occupant of the cottage at the time was Mr. T. B. McKinley, deputy agent, who, until his transfer to another department, combined his simple housekeeping arrangements with those of the field party.

All land traffic between Eureka, the county seat of Humboldt County, and Crescent City, county seat of Del Norte County, passes this way over the only north and south road so far constructed west of Shasta Valley.

The hills directly back of the settlement have a good deal of open pasture land, and there is an untimbered flat half or three-quarters of a mile wide on the south bank of the river, but, with exception of a small area of partially cleared bottom land and an occasional spot bare of trees, all else in sight is coniferous forest, composed largely of fine redwood growth. For the most part this forest is dark, gloomy, and practically impenetrable, except where indian or other trails exist.

The open land is largely in demand for dairying purposes, the milk produced thereon being hauled to a cheese factory at Requa. On the very limited alluvial bottom lands the timber has been destroyed to admit of crop tillage, some grain being grown for hay or soilage crops.

Roads extend up each side of the Klamath River for a few miles only, and direct communication with settlements farther up the river is by canoe, small power boats, or trail.

The rainfall in this part of the state is very heavy, and the dry season is not only very short, but also more or less damp, with much fog and consequent absence of sunshine. Snow rarely falls in any quantity here, and frost is seldom severe so near the ocean at this latitude.

Dr. Walter K. Fisher (Condor, Vol. IV, 1902, pp. 111-114) has described this part of the redwood coast belt and touched upon its zonal and faunal peculiarities. After going into some detail concerning the difficulties of defining the life zones of the northern California coastal redwood strip, this author summarizes the situation as follows:

"At present it seems that the Northwest Coast Boreal District, *in California* occupies only a very narrow and restricted belt in the form of *dilute* Canadian, south to the vicinity of Cape Mendocino. This belt comprises only the densest forests of redwood, Sitka spruce, western hemlock, Pacific cedar and Lawson cypress. All the other country including an open belt along the coast, the more open river valleys, mutilated districts, as well as the mountains immediately to the east of the redwoods belonged to the Humid Transition. The Humid Transition still farther east merges into the Arid Transition or belt of the yellow and sugar pines."

Dr. Fisher thinks that the reason that most resident birds of this humid coast belt are darker than those of the interior is not so much the result of heavier seasonal rainfall and greater amount

of moisture present, but rather the effect of the restricted amount of total sunlight resulting from a greater number of cloudy or foggy days than has the interior of the country. He cites the case of the higher interior mountains with a heavy seasonal rainfall, but with little fog or cloudiness between the winter storms and with vastly more sunshine in summer than has the Humid Coast Belt, where the resident birds are of lighter coloration, as proof of his explanation.

Some doubt concerning the soundness of this hypothesis arises, however plausible it may seem, when, in the case of the Blue-fronted Jay (*Cyanocitta stelleri frontalis*), specimens from the coastal region in Sonoma County, California, are found to be practically indistinguishable from many taken in the Sierras (Condor, Vol. X, 1908, pp. 133-134).

Several days were lost through the non-arrival of much of the equipment, part of which had been started in advance by parcel post so as to insure its being there, but all necessary articles finally arrived.

The weather at first was most unpromising, but field work was carried on between showers so far as possible, since the birds were very chary about appearing in the open in such a moisture-laden atmosphere.

A trip was made around the neighborhood in the endeavor to locate a cabin in which to camp and be in the midst of the wild life of the woods, but nothing was found sufficiently promising to make up for the advantages of the room, light, and dryness of the quarters in the Indian Agency cottage in town, while also more speedy means of reaching the best fields for observation in the vicinity were found.

Bird life is not well represented in this region, and birds are most numerous, per unit of area, in the more open lands. In the forest sometimes for miles at a time no bird was seen. Those species which might inhabit the woods are noticeably shy in this forest country and without apparent reason, unless it be that their spirits are depressed by the humidity and the gloom which so largely prevails. During the stay of 38 days in Del Norte County it rained, more or less, on 15 days, and was foggy, overcast, or partially cloudy on 16 more, such days making the forest anything but a cheerful place. This shyness in the birds was particularly noticeable in the case of the Varied Thrush, whose notes were

identified upon our arrival at Requa, but of which no individual was actually seen for over three weeks. It was again exhibited in the case of the Northern Wren-tits, which as a rule are rather inquisitive little bundles of activity, busily bustling about the bushes, often apparently scolding away at the tops of their small voices and frequently coming boldly into view if their curiosity is aroused by a squeaking noise made by an observer; yet in Del Norte County, while quite a number were heard, only one or two were actually seen in spite of strenuous efforts to obtain specimens.

The most numerous birds in the settlement, and in the more isolated bushes on the unforested hillside back of it, were the resident Nuttall Sparrow, associated with quite a number of the Golden-crowned Sparrow, then in course of migration to its northern breeding grounds. This latter species was noted as late as May 10.

Western Robins were commonly met with in this vicinity, and could almost be called abundant, but the gloomy weather seemed to affect their spirits, for they were not as songful as one might have expected.

Flocks of Band-tailed Pigeons, sometimes numbering a couple of hundred individuals, were constantly on the watch for freshly sown grain fields, always ready to pick up the seed that remained uncovered. These grain fields were little more than small patches of ground wrested from the forest, and in this moist climate were plowed and planted late in the season. The farmers claim that the pigeons do considerable damage, and are not disposed to believe that only surface grain is taken. They certainly showed a good deal of energy in the matter of shooting birds to save their crops, especially when they knew that the game warden was called elsewhere. They would lie in wait in hollow stumps or in brush piles and whang away when a flock gathered. It was rather singular that no dead pigeons were ever seen in the fields after such shooting. The farmers had a right to protect their crops from damage though not to use the birds for food, but the birds were very toothsome, and—?

It is very evident that the Band-tailed Pigeon has a long breeding season in this locality, judging from the reports of reliable persons who found nests in the summer time, while birds were found by us to be breeding at least as early as May 6. On that date Mr. Littlejohn came across a broken fresh egg of a Band-tailed Pigeon on a mossy bank upon a hillside. To make the

identity doubly sure, sticking to the egg shell was a breast feather of the parent. It seemed as if some pitch from a coniferous tree might have adhered to the bird's breast while it was perching on a limb and had stuck the feather to the egg when the bird next sat upon it. Or possibly, a drop of balsam had fallen on the egg when it was temporarily unprotected, with the same result, and the bird, probably startled by something, had left the nest suddenly, carrying the egg with it far enough to clear the edge of the nest and let it fall to the ground. The ovaries of birds taken by us near the end of May showed eggs ready to be laid, and two men who live in Requa during the summertime told stories of finding nests, in which the egg had been laid, in the alder trees in June. Whether this means a second brood or not is a matter of conjecture.

On April 23 many Tree Swallows were found flying about the tall, ghost-like stumps of dead trees in the partly cleared bottom-land north of the town, and these birds remained there during the nesting season. On this same date a few Barn Swallows were seen as well, while the Violet-green Swallow was noted on April 26. The Cliff Swallow did not appear until May 7, when it suddenly became abundant around an old cannery in the town.

As one of the objects of the trip was to note dates of arrival of migrants, a careful watch was duly maintained for such.

On April 23 the writer had a very close view of a flycatcher which seemed without doubt to be the Traill. The bird could not be secured because it kept tenaciously to some willows overhanging a swift stream, often not over 8 or 10 yards away. No other individual of this species was seen until May 28, when, for three days, it was quite abundant at Requa, apparently disappearing completely after May 29, as none was noted thereafter.

Woodpeckers were remarkably scarce for a country so full of timber, and apparently so favorable for the support of that family (*Picidæ*). An occasional Harris Woodpecker was seen or heard. The Gairdner Woodpecker was rarely met with and but one Lewis Woodpecker was seen. A few Northwestern Flickers were evidently breeding at Requa, and their piercing cry was often heard, the sound magnified by the surrounding forest. There were plenty of soft-wooded trees for these birds to breed in, but the comparative gloominess and dampness did not seem to attract the woodpeckers to any great extent. Perhaps there was so much territory available to them that they had not yet increased in numbers sufficiently to occupy it all.

The Mendocino Song Sparrow was quite abundant in places that were especially wet, where either bunches of sedge or low bushes or brambles gave adequate protection, and, at the time of our arrival, this species was already nesting. A nest containing three eggs was found on April 24, and it was left to see whether more eggs would be laid, as no bird was sitting on it. Three days later it was again visited but no more eggs had meantime been laid, and the set turned out to be too far incubated to save. In the next fortnight two more nests were found, but the eggs of only one could be blown. There must have been quite a number of them in the thick blackberry brambles along the small swampy streams, where they were safe—from human hands, at least. One of these song sparrows was seen carrying nest material as late as May 17.

Soon after the party's arrival at Requa the notes of a hermit thrush were heard, and an earnest effort was made to identify the birds. They were extremely shy, however, and it was May 2 before one was taken, and May 6 another. A fleeting glimpse of several others was obtained but no proof was found of its breeding there. The two specimens secured are nearer to the Alaska Hermit Thrush than to anything else.

While the Oregon Jay has long been known to inhabit the Humboldt Bay district in very limited numbers, it was hoped that it might be found fairly numerous farther north, but at Requa only four were noted. The first one was seen on April 30, when, toward the end of an almost fruitless morning, Mr. Littlejohn shot the first chipmunk so far seen on the trip. The sound of his shot startled a heretofore hidden Oregon Jay out of the tree above his head. It flew to another tree near by that had a mass of fire-killed branches quite low down. The writer stalked the jay and shot it, but his shot frightened out a Dusky Horned Owl, which fell to the second barrel, sailing rather slowly to the ground. It was followed for a distance by another Oregon Jay. The first was the only specimen of this jay secured, one other being shot later on, but lost in heavy brush.

There was something very familiar about the sight of the California Brewer Blackbird (*Euphagus cyanocephalus minusculus* Grinnell)* picking up horse hairs for nest lining in the roads near the dairymen's dwellings, or walking about among the cows, but

*Condor, July, 1920, p. 153.

there were only a few pair of these birds in the neighborhood. The most northerly coast record heretofore of this bird has been under its old name, from Hoopa Valley, Humboldt County.

The California Linnet, also a very familiar bird in most of this state, appeared on April 27, when a single male was seen, but by the end of the first week in May it was common in suitable places near the village. This species has not been before recorded from the coast north of Humboldt Bay.

The only examples of the genus Junco seen at Requa were secured on April 24 and May 7, the first one from among a flock of Golden-crowned Sparrows. This specimen, a female, is apparently an Oregon Junco, but the pink marking on the sides and flanks is heavier than is often seen. The second is another female, with markings so light that one hardly knows where to place it, but it is provisionally placed with *oregonus*.

The Green-backed Goldfinch was first noted on April 26, when two were seen, but it never became very numerous. The Willow Goldfinch, on the contrary, first noted on April 28, soon increased in numbers and later was quite plentiful.

The Golden Pileolated Warbler was noted at Requa on April 22, but probably it was there even earlier. It was common in all suitable localities.

On May 1 it was raining hard all morning. Soon after breakfast an alder tree near the house was seen to be alive with warblers, apparently the result of a small migratory wave. The species represented were Townsend—seen for the first time—Lutescent, and Golden Pileolated. This tree seemed to be a favorite rendezvous, for individuals kept coming and going all the morning. The Townsend Warbler did not remain to breed, however. Some Yellow Warblers, either the Alaskan or Western, were noted by Littlejohn at this time.

On May 4 the Russet-backed Thrush arrived on the scene. While its short call and single whistle note were heard every day, none of the birds was actually heard to sing until May 11, when several were in full song at daybreak. This thrush was very wild at first and although living in the blackberry vines and bushes among the houses of the village, it was seldom seen. Afterwards—probably after the young were hatched—it became very tame and numbers might be seen sitting on top of fences, absolutely undisturbed by passers-by.

Across the river from the village of Requa was quite an extensive flat, above all but the highest floods, which seemed as if it might be a possible breeding place for some form of marsh sparrow (*Passerculus*), although none had been recorded from here. On May 7 this flat was explored and three males of this genus, most closely approaching the form described by Dr. L. B. Bishop as the Dwarf Marsh Sparrow (*Passerculus sandwichensis brooksi*), were secured. Some other males were secured later on, and the conclusion reached that this species was breeding there, while it was also found at Crescent City, undoubtedly nesting, extending the breeding range of this subspecies and bringing it down to the actual seashore, yet not in saltwater marshes. All this was brought out in a recent article (*Condor*, Vol. XXIII, 1921, p. 164).

On May 18 a Western House Wren was taken which proved to be the only one seen during the stay in Del Norte County. On that date also a pair of American Ospreys were seen carrying nesting material into the top of a tall stump in a partially cleared field on the north bank of the Klamath, not far from Requa.

Efforts were made to ascertain whether the Varied Thrush was breeding in the vicinity of Requa, but no success was met with until May 13, when one was secured. These birds were apparently very scarce, and were so shy that it was extremely difficult to find any. Finally, by patient camping in the darkest sort of places where brush was thick under the trees, several were secured, one of which proved to be a nesting female. No nests, however, were discovered, while the character of those portions of the forest which the Varied Thrush selects for nest locations made the search for nests so unpromising of results that efforts in this line were considered unprofitable.

Constant watch was maintained for the Western Winter Wren, which it was thought would be met with in numbers, but it was not until May 30 that any were noted, and only one or two individuals even then. Some of the Indians at Requa asserted that the unusually heavy winter of 1914, with deep snow and intense cold, killed off these friendly little birds, and this was corroborated by Mr. Zwerline, a dairyman living three miles from Requa, to whom many thanks are due for numerous courtesies shown to our party. These little wrens were described as frequenting the barns and sheds in a most sociable manner each winter until this extraordinarily heavy one of 1914, during which numbers of them, and

of other small birds were found lying dead upon the deep snow. Since then this species has been very rarely seen there.

The party was absent from Requa from May 20 to 27 and on its return it was found that some new species had arrived. The most interesting of these was the Traill Flycatcher which was noted on May 28, on which day several were seen or heard. On May 29 quite a number were seen and several secured for positive identification, but not one was observed after this date. The locality was not one adapted to the needs of this species, and it was rather surprising to find it migrating thus along the coast, especially as there was no adjacent territory toward the north that seemed attractive to it. Possibly those birds noted were moving easterly up the Klamath River to a more suitable locality farther inland, but they had apparently chosen a peculiar line of flight to reach their destination.

A pair of Arkansas Kingbirds was seen on May 7 on the flat across the river from Requa and another was seen at the same place on June 2. This locality seemed to be rather out of the way for this species of flycatcher also.

One day in Requa, Deputy Game Warden Prescott mentioned a rare kind of bird he had seen shortly before, while he was at Patrick's Creek, Del Norte County, California, 32 miles northeast of Crescent City on the road to Medford, Oregon. It was impossible to identify the species from his description, in which he stated that these birds had arrived in a flock, were doing much damage in the garden, and had never been seen in that locality before. It seemed advisable to make an investigation of this matter, especially as a visit to this region, intermediate as it was between the Humid Coast Belt and the dryer interior, would be worth while under any circumstances.

The journey in the auto stage from Requa to Crescent City took $3\frac{1}{2}$ hours for the 24 miles on account of the fearful conditions of the muddy roads, which were next to impassable. The visit to Patrick's Creek extended from May 19 to 26, and the time there was passed in collecting birds, trapping rodents, and listing the species of birds met with. Nothing very interesting was found there. The country is mostly covered by brush, with timber running up the deeper cañons of the tributaries of Smith River, but forest fires have swept the country so frequently that much of the brush is short and bird life is rather scarce. What does exist

there is intermediate in character between Coast and Sierran forms, as might be expected. The birds that were the main object of the trip had moved on, but remains were found of some that had been shot while destroying freshly sprouting garden seeds, and these were sufficiently well preserved to identify the stranger as nothing more than the common winter visitant to so much of California, the Golden-crowned Sparrow.

Although Patrick's Creek Hotel, where the party stayed, is only some 18 to 20 miles from the coast in a straight line, the crested jay found there proved to be very much like the Blue-fronted Jay (*Cyanocitta stelleri frontalis*) of the Sierras.

This locality was such a poor one, so far as animal life was concerned, that the return to Requa was made as soon as it became evident that the surrounding hills offered no more inducement to the collector than did the cañon in which the inn is situated, and Crescent City was reached on the evening of May 26.

It was intended to stay over here for a short time to investigate the bird life in the vicinity, and early the next morning a start in this work was made. South of the town a pair of Dwarf Marsh Sparrows was located, and the male secured for identification, but the female disappeared. No others were discovered on that side of town and a rising wind soon developed into such a gale that all work had to be abandoned and shelter sought indoors. This gale brought on such a storm of rain the next day that nothing could be done, and as a slide threatened to block the road to Requa at any moment it was deemed best to return there while it was still possible, and Requa was reached again on May 27.

No mention has been made so far of the mammals taken during this field work. It may be some time before opportunity presents itself for the proper identification of those secured, but a few words concerning them will be in order. For good reasons, operations were confined to the orders of Rodentia and Insectivora (shrews and moles).

Traps for these animals were kept constantly set, and the locality changed every few days, or as soon as the traps failed to attract. The dampness and accompanying vegetation in this part of the state made it preeminently a place in which to look for members of the shrew family, and especial efforts were made to secure such, with fair results. A fine series of the large Pacific Shrew (*Sorex pacificus*) was obtained, together with specimens of several

other genera, including moles and shrew moles. Many mice, of several species, were obtained, and gophers of at least two species.

It was not, however, a good year for small mammals, and some species that might well have been expected to appear were not found in the traps. A teamster hauling wood stated that while last year every pile of cord wood that he hauled had numbers of different kinds of rats or mice under it, which were plainly visible when the last sticks were removed from the ground, there were practically none this season. One jumping mouse (*Zapus*) was taken in a trap, but all that was found of it, after some animal had used it as a basis for a nocturnal repast, was its long tail with a bit of fur attached.

It was rather astonishing to discover that the resident Indians were unaware of the existence of some of the shrews that were obtained in our traps.

These Indians had names for all the animals except these smaller shrews, but, when the attempt was made to set down these names in English it was disheartening to be met with the statement made by educated Indians that there was no possible way to express the necessary sounds with the English alphabet.

That the Western Bushy-tailed Wood Rat (*Neotoma cinerea occidentalis*) is often to be found on the ocean shore in California, is questionable, but it certainly occurs at times at Requa. Persons connected with the Klamath River Packing Company's salmon cannery close to the mouth of the Klamath River related a story of having recently killed one with a stick inside the cannery, which was corroborated by Mr. Geo. R. Field, manager of the company and member of the California Academy of Sciences. The Indians also stated that this species was occasionally found at sea level in the vicinity of Requa, but none seemed to be here during the stay of the Academy field party.

The Point Reyes Mountain Beaver (*Aplodontia phæa*) was present at Requa in small colonies, but the traps used by the party were too light to hold these powerful little animals, and none was captured. Evidences of their work were noticed, and Mr. Field reported that they had repeatedly diverted for their own use a small spring-fed stream which was led to tanks for the use of the cannery, so that eventually matters had to be arranged to prevent such interference with the flow of water.

By the end of May there hardly seemed to be sufficient prospect of any further important migratory bird movement to warrant a longer stay at Requa, and the return to Eureka was made on June 2. A set of eggs of the Snowy Plover (*Egialitis nivosa*) was secured on the shore of Humboldt Bay on June 3, and arrangements were made with Mr. C. I. Clay, and Deputy Game Warden Lowe, for a trip to Myer's Ranch, on the South Fork of Eel River, some 60 miles south of Eureka, to look for the Rose-breasted Grosbeak (*Zamelodia ludoviciana*) which has been reported from there, and thanks are due to these two gentlemen for their kind assistance in this matter. This trip was made in Mr. Lowe's car on the afternoon of June 4, the party remaining at Myer's Ranch for 24 hours. At the edge of a cultivated flat, included in a long, V-shaped bend of the river, were several cherry trees heavily loaded with ripe fruit, and birds were constantly flying to them from the redwood forest near by, but no Rose-breasted Grosbeaks were seen. Mr. Grant Myer without doubt is familiar with this bird, and he stated that several had been seen a couple of weeks previous to this visit, but none had been seen since then. This was corroborated by a neighbor on whose property the cherry trees were situated. These birds are reported to come into the neighborhood when the peaches and apricots are ripe, that is, in July, but in 1921 a frost killed these fruits and none of the birds was expected. In fact, later reports are to the effect that none was seen. This species must evidently breed in some locality not far away, and probably in a small isolated colony that has never increased. Mr. Clay stated at a later interview that he had come across a person who claimed to know where this breeding ground was, and hopes to be able to visit it next season in company with his informant.

While at Myer's Ranch, the field party found the Monterey Hermit Thrush evidently breeding there, as an adult bird was seen feeding its young. A couple of specimens were secured for identification. This is the most northerly record for this sub-species, so far as known. This record, as well as that of Dwarf Marsh Sparrow, was published in *The Condor*, Vol. XXIII, 1921, p. 164.

The day following the visit to Myer's Ranch, the spring field work was brought to a close, and the party returned to San Francisco.

At the end of this paper is a list of birds noted at Requa during the spring work of the field party, giving the dates of arrival of

many of the summer migrants. Many of these dates are very close to the actual ones, while others are, of course, approximate in cases where the species might have been present several days before it was met with.

AUTUMN FIELD WORK (1921)

In the autumn season of the last two years (1919 and 1920) a party from the Department of Ornithology was placed in the field with the principal object of observing the fall migration of fox sparrows from the north. In those two seasons the ground selected for this work was on the Inner Coast Range, in Lake and Mendocino counties, California. This year (1921) it was decided to make such observations close to or on the actual coast of northwestern California, and to revisit some of the territory covered in the work of the preceding spring. It is the intention of this department to divide the state into longitudinal strips, as it were, and to examine one strip each fall, so as to ascertain, so far as possible, the southerly route taken by the different species of fox sparrows. The greatest element of difficulty in this work is that of discovering favorable spots for such observation.

Another reason for selecting the northwest coast for the field work this fall was the desire to investigate further the status of the crested jay (*Cyanocitta stelleri* subsp.) in that part of California. This jay has been placed with the Coast Jay (*Cyanocitta stelleri carbonacea* Grinnell) for many years, but suspicion was aroused in the mind of the writer some years ago as to the correctness of this diagnosis. This region had been visited the previous spring with the idea in view of definitely settling the matter. Specimens in breeding plumage of this jay were obtained at several places on or near the coast; but the fact that it was very difficult to determine at just what date such specimens could correctly be compared with others from the San Francisco Bay region, from which the Coast Jay was described, and where the climate is drier and more moderate with brighter winter days, made it seem most desirable to obtain specimens in the new fall plumage, when there would be no question of fading or wear. It was found that as late as the third week in September very few of even the adult jays at Requa had attained a state of full plumage, and the young were greatly behind the young of even date in the San Francisco Bay region.

The field party consisted of the departmental curator and Mr. Chester C. Lamb, as assistant. Mr. Lamb's car was the means of transportation, and a suitable camp outfit was part of the equipment.

Requa was decided upon as the most northerly objective and it was reached on September 15. Camp was made about three miles from town near the Zwerline dairy, to the owners of which many thanks are due for numerous courtesies and assistance.

It had been an unusually dry summer in Del Norte County and the springs were mere trickles of water, but it commenced to rain on September 17, and kept it up for three days, making it impossible to secure much in the way of specimens, either of birds or mammals.

The Indians stated that most of the birds were high up on the mountain ranges feeding on the berries then ripe. There certainly were not many down on the lowland. However, a number of specimens of the desired jay were obtained, principally immature birds, in sufficiently good plumage to indicate that instead of being intermediate between the Coast Jay (*Cyanocitta stelleri carbonacea*) of the San Francisco Bay region and the Steller Jay (*Cyanocitta stelleri stelleri*) of British Columbia and southern Alaska, this northwest coast bird is much closer to the Blue-fronted Jay (*Cyanocitta stelleri frontalis*) of the interior and more arid regions of this state. In fact there is good reason to believe that this jay is intermediate *between the two latter forms*, instead of the two former, as the writer has endeavored to make clear in another paper (Condor, Vol. XXIV, 1922, pp. 127-133).

No fox sparrows were noted in the vicinity of Requa, although there was good cover and feed near by. Apparently at this time, September 15-21, none had worked in there, and it seemed to be a fact that this locality was not on a regular line of migration. The date was not too early, for in other seasons northern birds had been found in the interior farther south at this time, and fox sparrows have been noted in Golden Gate Park, San Francisco, much earlier in September.

There were a good many Northern Wren-tits in a thick growth of wild lilac near camp, but none could be induced to show itself, much as specimens in fresh feather were desired. Mention was made of the scarcity of the Varied Thrush in the breeding season,

and the same condition prevailed in the fall. Only one individual was noted during the week's stay at Requa.

No fox sparrows having appeared, and the time being so short in which to intercept any migratory flight of this genus, it was decided to move farther south and endeavor to find a locality better suited for observation in this line. The return toward Eureka, Humboldt County, was made on September 21, a sharp lookout being kept in all brush-covered localities for indications of fox sparrows, but not a single individual was seen during the trip.

After a consultation with Mr. C. I. Clay of Eureka, who kindly assisted the work of the party in many ways, and whose knowledge of roads and localities in Humboldt County is very complete, the vicinity of Kneeland Postoffice was selected as a promising locality in which to look for fox sparrows. Mr. Clay not only led the way to Kneeland, but gave several demonstrations along the road through the fir forest of how to capture the Long-tailed Tree Mouse (*Phenacomys longicaudus*). In fact, if it had not been for this practical demonstration of just how to proceed in the matter, it is doubtful if any mice would have been secured by the field party. At least in part of the spring time, the larger nests contain one female with (usually) two or three young, while the male has a small nest of his own, probably often in another tree nearby, as no nests of males were discovered in the small sapling fir trees in which the females' nests were found. In each case there were branches interlocking from adjacent trees that could furnish means of communication with the family nest. But few nests discovered by us were occupied, and these only in forest that had been extensively thinned out by wood cutting. Careful watch was kept for the nests of this mouse in every locality visited by us, but the only ones discovered were on the road between Eureka and Kneeland Postoffice. Dr. Walter P. Taylor has given such a full account of this mouse, its habits, etc., (Proc. Cal. Acad. Sci., Series 4, Vol. V, 1915) that it is not advisable to go into further details of it here, interesting though it be.

Kneeland Postoffice was reached September 22, and a camp site selected at the southeasterly end of Kneeland Prairie, where the open rolling land on top of the ridge ends, and the heads of several deep, timbered cañons converge. These cañons are in different watersheds, draining into Mad River on the north and into a tributary of Eel River on the south. There was fair cover for fox

sparrows near camp, and a low gap extending from one watershed into the other made it appear to be a good locality in which to look for a line of migratory flight.

This camp was at an elevation of about 2000 feet, and some 15 miles southeasterly from Eureka, in a direct line. Fox sparrows were noted in small numbers from September 23 to 30, and a few secured each day but one, which was rainy and foggy. The birds mainly appeared to be drifting along rather than moving in an active flight except upon September 26, when Lamb came across indications of a considerable migratory movement. Those specimens secured at Kneeland appear to be closest to the Sooty Fox Sparrow (*Passerella iliaca fuliginosa*), although not typical. A separate paper has been published on this subject (Condor, Vol. XXIV, No. 2, March-April, 1922, pp. 48-53), which gives a more detailed account of the observations on this genus.

A good series of the crested jay was secured at Kneeland, which is sufficiently near the sea coast to allow of the inclusion of specimens taken there among those from the actual coast line.

There were a few grouse (*Dendragapus*) here, but they were extremely wary and none was secured for absolute identification.

Several marsh sparrows were found on the open prairie, some specimens of which were taken, among which was a good example of the Dwarf Marsh Sparrow, and two specimens of the Savannah Sparrow (*Passerculus sandwichensis savanna*), as identified by Mr. H. S. Swarth.

While the Northern Wren-tit was heard and not seen at Requa, the opposite was the case at Kneeland, for this bird was not heard to any great extent, but many were seen. In fact, during the time when members of the party would be watching in the thick brush for fox sparrows, there would be one or two of the wren-tits constantly fussing about him, often interfering considerably with the main object of the vigil.

The Northern Spotted Owl was heard here every night, as it had been also at Requa, but it took good care to remain out of sight.

The number of fox sparrows seemed to decrease toward the end of September, and as there did not appear to be much chance of any very active migratory movement among them at so late a date, it was decided to move camp.

Mr. Clay suggested a visit to a locality in the southwestern corner of Humboldt County where an extensive area was covered with a thick growth of a white-flowered thorn bush, which might be an attractive place for fox sparrows. This suggestion was followed, and we started from Kneeland Prairie on September 30 with the thorn country as our objective, but with the idea of making several stops along the road.

Capetown, about 25 miles southwest of Eureka, near the mouth of Bear River, was the first stop, and a temporary camp was established in the gravelly bed of the river about half a mile above its mouth. The main object in stopping here was to obtain some of the Mendocino Meadow Mouse (*Microtus californicus constrictus* Bailey), of which Capetown is the type locality. In Stephens' California Mammals, published in 1906, the type locality of this subspecies is given as 'Mendocino County,' whereas it should be 'Cape Mendocino, [Humboldt County], California,' and the geographic distribution 'coast region near Cape Mendocino,' as given in the original description (N. Amer. Fauna, 17, June, 1900, pp. 36, 37), with mention of its abundance at 'Capetown, just back of Cape Mendocino.'

Unfortunately, this was an "off year" for this species in its type locality. Two nights of trapping only produced one specimen, in spite of the fact that Mr. Joseph Dixon of the Museum of Vertebrate Zoology, Berkeley, California, describes them as being so numerous there that there was no necessity for baiting traps. He visited his unbaited traps three times in one day, and found as many specimens of this meadow mouse in them as he could possibly take care of. They were so plentiful in one particular spot that they were caught as they accidentally ran over the triggers of the traps. On the occasion of our visit, not a single specimen was captured in this formerly so thickly populated area, which Mr. Dixon verbally described in such a way as to be readily recognized.

In fact, it seemed to be an off season for small mammals wherever we set traps, for the returns were meager compared with the efforts made.

While most of the country surrounding the camp at Capetown was open pasture land, bleak and bare, there was a very steep hillside just across the little river from the camp that was covered with a dense growth of hazel and salmonberry bushes, which seemed to be a favorite locality for fox sparrows, as many were

noted there and some secured. Some jays were heard, but none taken.

On account of the want of success in obtaining jays and small mammals, and because of threatening winds and fog, only two nights were passed here.

On October 2, the southern journey was renewed along the coast and camp made at an attractive-looking spot on Mattole River, five miles south of Petrolia (Humboldt County). This spot was only about six miles from the ocean, but well protected from the sea breezes by a high intervening ridge. A good series of jays and some fox sparrows were taken here as a sample of what the locality produced.

The principal matter of interest at this camp, however, was the number of owls in the vicinity. As many as five species were heard at once, or at least within a few minutes, in the evening. These were the American Barn Owl (*Aluco pratincola*), Northern Spotted Owl (*Strix occidentalis caurina*), California Screech Owl (*Otus asio bendirei*), Dusky Horned Owl (*Bubo virginianus saturatus*), and the Coast Pygmy Owl (*Glaucidium gnoma grinnelli*), all of which were also heard at intervals throughout the night. Attempts were made to call up the Northern Spotted and the Coast Pygmy owls to "spot" them with a light, but while they would come very close, it was impossible to discern them in the heavy foliage of the surrounding trees, and none was seen in the daytime.

There being no particular object in remaining at this camp longer than to obtain examples of the jays and fox sparrows here, the next move was made to the thorn country. From the description of it obtained on the road, a good camping ground, with an abandoned cabin in case of a storm, was found about two miles northwest of what is down on the current maps of Humboldt County as "Thorn," but which at present is merely a ranch house. This camp was also on Mattole River, three or four miles from the southern boundary of Humboldt County, on the road from Garberville to Shelter Cove and six or seven miles from the ocean shore, protected by a ridge, as was the last camping place.

A great deal of the country around here was covered by a heavy growth of thorn bush (*Ceanothus incanus*), among which were clumps of "wild coffee" (*Rhamnus californicus*) or "cascara sagrada" as it is often called, and "wild lilac" (*Ceanothus thyrsiflorus*).

The fruit or seeds of these plants form an attractive variety of diet for some species of birds, and the number of birds present showed keen appreciation of the opportunities for feasting that such a combination offered.

The species most numerous in the thorn bush were Sooty Fox Sparrow (*Passerella iliaca fuliginosa*), California Purple Finch (*Carpodacus purpureus californicus*), Nuttall Sparrow (*Zonotrichia leucophrys nuttalli*), and Golden-crowned Sparrow (*Zonotrichia coronata*). The Sonoma Thrasher (*Toxostoma redivivum sonomæ*) was found here and several specimens taken. So far this is the most northern coast record for this genus, though it occurs at a more northern latitude in the interior of the state. Three specimens were secured of which only one had recovered completely from the autumnal moult. This bird seems darker than typical *sonomæ*, but this may be entirely due to the freshness of the plumage, as compared with that of other specimens examined.

In this thorn country fox sparrows were very numerous, especially in some limited areas. While it was possible to bring one or two or even six or eight of these birds into view in almost any part of the thorn-bush territory by arousing their curiosity with a squeaking sound, there were certain spots where they were even more numerous. One of these was a small narrow cañon with water at the bottom, more shaded and with the ground damper than the surrounding area, and here it was easy to cause 20 to 30 birds at a time to drop their ordinary activities in the seclusion of the brush and to come out into full view, often within a few feet of the observer.

As the fox sparrow is naturally of a shy and retiring disposition this exhibition of curiosity overcoming fear was extremely interesting, and considerable time was passed observing the actions of the individuals, and in the endeavor to pick out any that might be of a different race from those that had yet been met with on this trip. So far as it was possible to judge under these conditions, about all of them appeared to be referable to the race of Sooty Fox Sparrow, of which a large series had already been secured, so that, in spite of such an opportunity, only a few specimens were taken. Among these only one was referable to another form, which was the Townsend Fox Sparrow (*Passerella iliaca townsendi*). As this matter has been gone into rather fully in *The Condor* recently (loc. cit.) it is hardly worth while to repeat it here.

The Band-tailed Pigeon was well represented here in the more wooded areas, numbers of them finding the different seeds and berries much to their taste. Crested jays, on the contrary, were scarce, only one of these being secured here, although others were heard in the distance.

During our stay at this camp the weather became threatening, and if caught here by a severe storm, we would have been delayed by the subsequent condition of the mountain roads beyond the time limit set for our return to headquarters. Hence the camp was regretfully broken on October 7, and the return trip to San Francisco begun in earnest. Soon after the highway was reached, however, a mishap occurred to the car which necessitated its remaining at the nearest garage, which happened to be near Cummings Postoffice, Mendocino County, for several days for repairs.

A good series of jays was collected there, but nothing of great interest was developed in the vicinity, unless the total absence of fox sparrows from the bush hillsides might be called a matter of interest, though rather a negative one. Sonoma Thrashers were heard in the brush, but only one was secured. As this locality may be considered as belonging to the Inner Coast Range and is only some 20 miles from Covelo, from which place this species has been recorded, and but little farther north, it might naturally be looked for here.

Trapping for small mammals had been conducted through this field trip, but the results had been small, as was the case during the spring field work. Some nights not a trap would be touched. Other than a poor representation of white-footed mice (*Peromyscus*) no other small mammals were secured except two shrews (*Sorex*) and one meadow mouse (*Microtus*).

Yet the owl family was well represented at every stopping place. It was very unfortunate that none was secured to find out what food was being eaten by the various species of owls identified by their nightly calls.

In the localities visited by the Academy field parties during the past three years rodents have been for the most part scarce, with no apparent reason. Possibly some epidemic has thinned them out. It is a well recognized fact that these animals are seldom abundant for any great length of time in any one locality, even one in which they may appear in great numbers in some years.

A sharp watch was kept in all suitable forest country for nests of the Long-tailed Tree Mouse as outlined elsewhere in this paper, but very few nests were found, and of those discovered in accessible situations the great majority appeared deserted.

LIST OF LAND BIRDS NOTED AT REQUA, DEL NORTE
COUNTY, CALIFORNIA, APRIL 21 TO JUNE 1, 1921

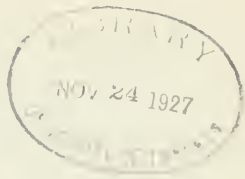
1. **California Quail** (*Lophortyx californica californica*).—Resident but not abundant.
2. **Band-tailed Pigeon** (*Columba fasciata fasciata*).—Several flocks seen. Breeding.
3. **Western Mourning Dove** (*Zenaida macroura marginella*).—Rare. One pair seen May 29.
4. **Turkey Vulture** (*Cathartes aura septentrionalis*).—Abundant. Feeding on dead eels on river bank.
5. **Sharp-shinned Hawk** (*Accipiter velox*).—Several seen.
6. **Western Red-tailed Hawk** (*Buteo borealis calurus*).—Resident.
7. **Duck Hawk** (*Falco peregrinus anatum*).—One Seen May 1.
8. **Northern Pigeon Hawk** (*Falco columbarius columbarius*).—One seen at close range independently by J. Mailliard and C. Littlejohn May 14.
9. **American Sparrow Hawk** (*Falco sparverius sparverius*).—Breeding. Probably resident. Not abundant.
10. **American Osprey** (*Pandion haliaëtus carolinensis*).—One pair seen building nest May 18.
11. **Dusky Horned Owl** (*Bubo virginianus saturatus*).—Resident.
12. **Western Belted Kingfisher** (*Ceryle alcyon caurina*).—Quite common in spring at least.
13. **Harris Woodpecker** (*Dryobates villosus harrisi*).—Resident. Not abundant.
14. **Gairdner Woodpecker** (*Dryobates pubescens gairdneri*).—Resident. Not abundant.
15. **Lewis Woodpecker** (*Asyndesmus lewisi*).—One seen May 13.
16. **Northwestern Flicker** (*Colaptes cafer saturator*).—Resident. Not numerous, at least in spring.
17. **Vaux Swift** (*Chatura vauxi*).—Noted on April 25 and often seen later.
18. **Allen Hummingbird** (*Selasphorus alleni*).—Summer visitant. Numerous during May.

19. **Arkansas Kingbird** (*Tyrannus verticalis*).—Apparently only passing through. Two seen May 7, both of which were secured (C. A. S. Nos. 23910, male, and 23911, female), and one noted on June 2; all three on flat across river.
20. **Olive-sided Flycatcher** (*Nuttallornis borealis*).—Summer visitant. First noted May 8.
21. **Western Wood Pewee** (*Myiochanes richardsoni richardsoni*).—Summer visitant. First noted May 28, but this species may have arrived during the absence of the field party from May 19 to 28.
22. **Western Flycatcher** (*Empidonax difficilis difficilis*).—Two heard April 23. One secured May 2. Rare summer visitant.
23. **Traill Flycatcher** (*Empidonax trailli trailli*).—One seen April 23, after which none was noted until May 28, 29, and 30, when many were seen. None found after latter date. May have arrived during party's absence May 19-28.
24. **Blue-fronted (?) Jay** (*Cyanocitta stelleri* subsp.).—Resident. Numerous. Intermediate between *Cyanocitta stelleri frontalis* and *Cyanocitta stelleri stelleri*.
25. **Oregon Jay** (*Perisoreus obscurus obscurus*).—Either very shy or very rare. Two seen April 30, one May 4, and one May 31.
26. **Western Raven** (*Corvus corax sinuatus*).—Several pair were from time to time in evidence.
27. **Northwestern Red-wing** (*Agelaius phoeniceus caurinus*).—Several pair were seen on the flat on the opposite side of the river, and several specimens secured. It seemed as if this species should nest there, but the birds had all disappeared by May 12.
28. **Western Meadowlark** (*Sturnella neglecta*).—A few were seen on the flat across the river.
29. **California Brewer Blackbird** (*Euphagus cyanocephalus minusculus*).—A few pair were nesting near farm houses.
30. **California Purple Finch** (*Carpodacus purpureus californicus*).—First seen April 24. Quite abundant later.
31. **California Linnet** (*Carpodacus mexicanus frontalis*).—First seen April 27. Abundant two weeks later.
32. **American Crossbill** (*Loxia curvirostra minor*).—Several flocks noted at various times in tree tops among the tall timber and some specimens taken.

33. **Willow Goldfinch** (*Astragalinus tristis salicamans*).—First noted April 28, abundant later.
34. **Green-backed Goldfinch** (*Astragalinus psaltria hesperophilus*).—Rarely seen. First noted April 26.
35. **Pine Siskin** (*Spinus pinus pinus*).—First one seen April 24. Abundant later.
36. **English Sparrow** (*Passer domesticus*).—A few of these birds were busy around the village.
37. **Savannah Sparrow** (*Passerculus sandwichensis savanna*).—Two birds of this form were taken in the open pasture on the hillside back of the village on May 4 and 5, respectively. None seen later.
38. **Western Savannah Sparrow** (*Passerculus sandwichensis alaudinus*).—One taken.
39. **Dwarf Savannah Sparrow** (*Passerculus sandwichensis brooksi*).—A few pairs breeding in flat across the river. Several (males) secured for identification.
40. **Nuttall Sparrow** (*Zonotrichia leucophrys nuttalli*).—Abundant in partially open country.
41. **Golden-crowned Sparrow** (*Zonotrichia coronata*).—Abundant during migration. Last seen May 10.
42. **Western Chipping Sparrow** (*Spizella passerina arizonæ*). One reported by Littlejohn April 21 as having been seen in tree close by Agency cottage. Only one noted.
43. **Oregon Junco** (*Junco oreganus oreganus*).—Several seen, two secured. Last seen May 7.
44. **Mendocino Song Sparrow** (*Melospiza melodia cleonensis*).—Abundant in suitable places. Breeding.
45. **Forbush Sparrow** (*Melospiza lincolni gracilis*).—Several seen in migration April 22. Two secured.
46. **Pacific Black-headed Grosbeak** (*Zamelodia melanocephala capitalis*).—First noted on May 4. Some seen later but never abundant.
47. **Western Tanager** (*Piranga ludoviciana*).—Rarely seen. First seen May 3.
48. **Cliff Swallow** (*Petrochelidon lunifrons lunifrons*).—A number appeared in the town on May 7, and quite a colony nested on an unused cannery building.
49. **Barn Swallow** (*Hirundo erythrogaster*).—Several seen April 23. Breeding.

50. **Tree Swallow** (*Iridoprocne bicolor*).—Many seen April 23 and later. Nesting in trunks of dead trees in bottom lands.
51. **Northern Violet-green Swallow** (*Tachycineta thalassina lepida*).—Seen April 26 and later.
52. **Western Warbling Vireo** (*Vireosylva gilva swainsoni*).—Two seen April 22, and a few seen later from time to time.
53. **Hutton Vireo** (*Vireo huttoni huttoni*).—Seen April 23. Scarce.
54. **Lutescent Warbler** (*Vermivora celata lutescens*).—Common summer visitant. Already present when field party arrived.
55. **California Yellow Warbler** (*Dendroica aestiva brewsteri*).—A few seen May 1 by Littlejohn.
56. **Alaska Myrtle Warbler** (*Dendroica coronata hooveri*).—Noted April 22 and a little later, when a few were seen during migration.
57. **Black-throated Gray Warbler** (*Dendroica nigrescens*).—One taken May 18. None other seen.
58. **Townsend Warbler** (*Dendroica townsendi*).—A number seen in tree by Agency cottage during rainstorm on May 1. Evidently migrating, as not seen later.
59. **Western Yellowthroat** (*Geothlypis trichas occidentalis*).—One shot by Mailliard on May 4 but not retrieved. A couple of others seen but not secured, presumably of this subspecies.
60. **Long-tailed Chat** (*Icteria virens longicauda*).—Arrived during absence of field party between May 19 and 28. Several noted. Apparently breeds.
61. **Golden Pileolated Warbler** (*Wilsonia pusilla chryseola*).—First seen April 22, but probably arrived at Requa before this date. Numerous later.
62. **Western House Wren** (*Troglodytes aëdon parkmani*).—One secured May 18. None other seen.
63. **Western Winter Wren** (*Nannus hiemalis pacificus*).—Not seen until May 30, when one or two were seen or heard.
64. **Tule Wren** (*Telmatodytes palustris paludicola*).—A few in marshy places along streams. One taken May 11.
65. **Chestnut-backed Chickadee** (*Penthestes rufescens rufescens*).—Common resident.
66. **Northern Wren-tit** (*Chamaea fasciata phæa*).—Resident but not numerous.

67. **Russet-backed Thrush** (*Hylocichla ustulata ustulata*).—First noted May 4. Abundant later. Nesting about village.
68. **Alaska Hermit Thrush** (*Hylocichla guttata guttata*).—Hermit thrushes were heard from time to time up to the middle of May. One referable to this form was taken May 6.
69. **Dward Hermit Thrush** (*Hylocichla guttata nana*).—One specimen referred to this form taken May 2.
70. **Western Robin** (*Planesticus migratorius propinquus*).—Abundant. Nesting.
71. **Varied Thrush** (*Ixoreus naevius naevius*).—Rare. Nesting in dark places in forest.



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II

NEW SPECIES OF HYNOBIUS FROM JAPAN

BY E. R. DUNN

Smith College

The following diagnoses record seven new species of *Hynobius* from Hokkaido, Hondo, Kyushu, and three of the islands in the Korean straits. Full description will appear in a revision of the family *Hynobiidae* which I am preparing.

My thanks are due to the California Academy of Sciences through Dr. John Van Denburgh for the loan of a very large collection of these animals.

1. *Hynobius retardatus* Dunn, new species

Diagnosis: A *Hynobius* with long, flat tail; toes 5; very long; vomerine tooth series very short. Gray-brown, a darker lateral stripe. Transforming at a large size.

Type: No. 35928, Mus. Cal. Acad. Sci., a young male, collected August 30, 1911, by V. Kuhne.

Type-locality: Noboribetsu, Iburi Province, Hokkaido.

Remarks: This well-marked species apparently represents the genus on Hokkaido.

2. *Hynobius kimuræ* Dunn, new species

Diagnosis: A *Hynobius* with a short, thick tail; toes 4; very long vomerine series. Purplish-brown; small, light flecks over whole upper surface.

Type: No. 8546, Mus. Comp. Zool., an adult female, collected in 1920, by Dr. Kimura and Dr. H. H. Wilder.

Type-locality: Mt. Heizan, near Kyoto, Hondo.

Remarks: An adult male, No. 27258, Mus. Cal. Acad. Sci., from Hida Province, Hondo, agrees in general with the type. This species is allied to *H. nævius*.

3. *Hynobius stejnegeri* Dunn, new species

Diagnosis: A *Hynobius* with a short, thick tail; toes 5; very long vomerine series. Chocolate-brown above, thickly marbled all over with rather large lighter blotches.

Type: No. 23901, U. S. Nat. Mus., an adult female, collected by Mr. Nakagawa.

Type-locality: Kumamoto, Higo Province, Kyushu.

Remarks: Closely allied to *H. naevius* and *H. kimura*, apparently replacing them on Kyushu.

4. *Hynobius vandenburghi* Dunn, new species

Diagnosis: A *Hynobius* with very flat tail; toes 5; medium series of vomerine teeth. Light, spotted with darker; sides of tail black, edges light.

Type: Bo. 26714, Mus. Cal. Acad. Sci., an adult male, collected May, 1911, by V. Kuhne.

Type-locality: Nara, Yamato Province, Hondo.

Remarks: This species is allied to *H. nebulosus* of Kyushu, which it replaces on Hondo.

5. *Hynobius ikishimæ* Dunn, new species

Diagnosis: A *Hynobius* with tail thick at base, flattened at tip; vomerine series of medium length; toes 5. Grayish-brown, with coarse black spots; edges of tail usually light, sides of tail not black.

Type: No. 26318, Mus. Cal. Acad. Sci., an adult male, collected October, 1910, by V. Kuhne.

Type-locality: Iki-shima, in the Korean straits.

Remarks: Allied to *H. nebulosus*, and to the species of the other islands in the Korean straits.

6. *Hynobius bicolor* Dunn, new species

Diagnosis: A *Hynobius* with a tail thick at base, flattened at tip; vomerine series of medium length; toes 5. Male usually black; female yellow, with coarse black spots; edges of tail yellow, the sides black.

Type: No. 26447, Mus. Cal. Acad. Sci., an adult male, collected October, 1910, by V. Kuhne.

Type-locality: Tsushima, South Island, in the Korean straits.

Remarks: Allied to the forms of Kyushu, Iki-shima, and Tsushima, North Island.

7. *Hynobius tagoi* Dunn, new species

Diagnosis: Similar to *H. bicolor* in structure, but brownish-gray, with fine dark stippling on whole dorsal surface.

Type: No. 26563, Mus. Cal. Acad. Sci., an adult male, collected October, 1910, by V. Kuhne.

Type-locality: Tsushima, North Island.

Remarks: The animals from the different islands in the Korean straits may be easily distinguished by the color characters which, though variable in the mass, are very constant in some of the details. Thus, none of the individuals from one island, although differing among themselves, ever looks like any individual from another island. This makes framing a diagnosis very difficult.



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III

UPPER MIOCENE LACUSTRINE MOLLUSKS FROM
SONOMA COUNTY, CALIFORNIA

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The collection of freshwater and brackish water fossils which are described in the following pages was obtained in 1916 by Mr. J. B. Kerr from deposits in the Petaluma and Santa Rosa Quadrangles of Sonoma County, California. The stratigraphy of the region has been studied in detail by Dr. Roy E. Dickerson¹ who concluded that " * * * the formation is a freshwater and brackish water phase of the marine San Pablo of upper Miocene age, as both are unconformably below the Sonoma group and its equivalent, the Pinole tuff."

The fossils do not furnish information which would necessitate a modification of that statement. The absence of such genera as *Parapholyx*, *Carinifex*, and *Gonidea*, all wide-spread in California Pliocene lakes, is very good evidence that these deposits antedate the Pliocene.

The localities at which the fossils were secured are more particularly described as follows, the numbers being of the Academy's series:

415. "In cañon about 2.1 miles north, 26° east of Elmore School, and 2.5 miles southeast of Mountain School Road, Petaluma Quadrangle, Sonoma County, California. Clay-shale and soft fossiliferous sandstones occur interbedded." The mollusks indicate that the deposit was formed in brackish water.

417. "In Haggin Creek, about 200 feet below bridge, one mile southeast of Penn Grove, Santa Rosa Quadrangle, Sonoma County,

¹Proc. Calif. Acad. Sci., 4th ser., Vol. XI, No. 19, pp. 540-543, 1922.

California. Strictly freshwater fossils occur in green clay beds, immediately above which is conglomerate. The strata dip 12° southwest and have a strike of north 60° west."

418. "In ravine, .4 mile south, 20° west from Sartori's ranch house, Petaluma Quadrangle, Sonoma County, California. Fossiliferous clay-shale dipping 55° southwest, strike, north 32° west." Fossils are strictly freshwater forms.

BRACKISH WATER SPECIES

The best preserved specimens of the brackish water fauna occur at locality 415. Here *Corbicula gabbiana* occurs in all of its many variations and in all ages. Associated with it are *Goniobasis rodeoensis* (Clark), a *Mya* and a *Nematurella*. All are either identical or closely related to forms found in various places in the uppermost portion of the San Pablo formation. This lends weight to the supposition that the two horizons are equivalent.

1. *Mya dickersoni* Clark ?

The hinges of a pair of *Mya* shells were found at locality 415 associated with *Corbicula gabbiana*. It cannot be positively stated that they belong to the San Pablo species to which they have been questionably referred, because only the shape of that form is known.

2. *Corbicula gabbiana* Henderson

Plate I, figures 1 and 2

- Cyrena californica* Gabb, Geol. Surv. Calif., Paleon., Vol. II, p. 26, pl. VII, fig. 45, 1869. (Not *Cyrena californica* Prime, Mon. Amer. Corbiculidæ, Smith. Misc. Coll., No. 145, p. 23, 1865.)
- C[orbicula] californica* Gabb, Dall, Trans. Wag. Free Inst. Sci., Vol. III, Pt. VI, p. 1451, October, 1903; placed in subgenus *Cyanocyclas* Ferussac, 1818.
- Cyrena (Corbicula) californica* Gabb, Clark Univ. Calif. Pub., Bull. Dept. Geol., Vol. VIII, No. 22, p. 459, pl. 56, fig. 2, 1915.
- Corbicula gabbiana* Henderson, Nautilus, Vol. XXXIII, p. 120, April, 1920.
- Corbicula californica* Gabb, Dickerson, Proc. Calif. Acad. Sci., Ser. 4, Vol. XI, No. 19, p. 542, 1922. Trask, Univ. Calif. Publ., Geol., Vol. XIII, p. 150, 1922.

At Locality 415, this species is exceedingly abundant in all stages of development. Fully mature individuals have thick, heavy shells, but young ones are thin and delicate. The hinge structure is figured herewith, apparently for the first time. The long lamellar, serrated laterals seem to distinguish *Cyrena* from *Cyrena*, but the genotypes have not been investigated thoroughly in this connection.

Unfortunately, Gabb's name, *C. californica*, was used by Prime for a very different species four years earlier. Prime's *californica* was a substitute name for *californiensis* Prime,² and this in turn was used to replace the name *Cyrena subquadrata* Deshayes.³ Under the latter name was described a living shell from "California" which Cooper⁴ stated came from the Gulf of California. Cooper also referred to the prior use of Gabb's name by Prime but substituted no other. Nor does it appear that any author prior to Henderson has re-named it.

Prime's ground for changing *C. subquadrata* Deshayes to *C. californiensis* Prime, was the fact that *Cylas subquadrata* Sowerby (1836)⁵ was considered to belong to the genus *Cyrena* by him and by Morris.⁶ Whether such action was justified or not cannot make Gabb's name tenable, as Henderson has shown.

This seems to be a characteristic species of the Upper Miocene brackish water deposits. Cooper⁷ listed it from three localities; Kirker Pass (type locality) and Green Valley, Contra Costa County; and Soquel, Santa Cruz County. Clark⁸ has listed it from six places in the Upper San Pablo Miocene. It has usually been found associated with such forms as *Mya*, *Littorina*, *Gonio-basis* and *Nematurella*.

3. *Nematurella euzona* Hanna, new species

Plate II, figure 10

Spire elevated, conical, composed of $5\frac{1}{2}$ whorls, sides slightly but evenly rounded. Surface marked only with fine, even growth striae; body whorl obtusely but very decidedly angulated; imperforate; columellar and parietal walls thickened; peristome not

²Proc. Acad. Nat. Sci. Phila. 1860, p. 276.

³Proc. Zool. Soc. XXII, p. 21, 1854.

⁴7th Ann. Rep. State Mineralogist p. 238, 1888.

⁵Geol. Trans. 2nd Ser. IV, p. 345, pl. XXI, fig. 8, 1836.

⁶Brit. Foss. p. 200, 1854.

⁷7th Ann. Rep. State Min. Calif. p. 238, 1888.

Univ. Calif. Pub. Bull. Dept. Geol. Vol. 8, No. 22, p. 459, 1915.

expanded or thickened. A small but very well-marked anal sulcus at the upper apertural angle. Operculum not found.

Altitude mm.	Measurements	Diameter mm.
5.		3.1 (Type)
5.5		3.7
4.5		2.9
5.8		3.6

Type: No. 511, Mus. Cal. Acad. Sci.

Type-locality: 415, Upper Miocene of Sonoma County, California.

The genus *Nematurella* Sandberger, or its allies, *Stenothyra* Benson, and *Euchilus* Sandberger, have apparently not been heretofore detected in America but are represented in European Tertiary by several species. There is little doubt, however, that the form with which we are dealing, as well as the much larger San Pablo species belongs therein. The latter was described as "*Littorina pittsburgensis*" by Dr. Clark,⁹ but his figure shows the decided sulcus in the upper angle. That species is 12 mm. in altitude, has a proportionately lower spire and no angulation on the body whorl.

4. *Goniobasis rodeoensis* (Clark)

Plate I, figure 3

Cerithium rodeoensis Clark, Univ. Calif. Pub. Bull. Dept. Geol., Vol. VIII, No. 22, p. 491, Pl. 69, figs. 1-10., 1915.

Billium rodeoensis (Clark), Dickerson, Proc. Calif. Acad. Sci., 4th ser., Vol. XI, p. 542, 1922.

This excessively variable species is common at localities 415 and 417. At the former it is associated with *Corbicula* and *Mya*, supposedly of brackish water habitat, while at the latter it is found with such strictly freshwater forms as *Planorbis* and *Lymnaea*. The only difference which could be made out in the shells from the two localities is the slightly greater attenuation of those from 415. This is visible in the figures given where *a*, *b*, *c*, and *d*, are from 415 while *e* and *f* are from 417. This difference, however, does not seem to be sufficient to warrant the separation of the forms specifically since, in a series of measurements, it is found to

⁹Univ. Calif. Pub., Bull Dept. Geol., Vol. 8, No. 22, p. 484, Pl. 65, fig. 22, 1915.

amount to only about half a millimeter. Certain forms of sculpture can be matched exactly at the two localities although more variations occur at locality 415.

Measurements

Locality 415		Locality 417	
Altitude mm.	Diameter mm.	Altitude mm.	Diameter mm.
13.	4.8	12.5	4.8
13.5	4.	13.5	5.
11.	4.4	16.4	6.2
12.5	4.1	11.	5.
. . . .	5.	12.	5.2
9.5	4.	13.2	4.5
11.5	4.3		

While variation in sculpture is great, in no specimen is there an approach to the Pliocene, *G. kettelmanensis* Arnold.¹⁰ It appears however to be a dwarfed counterpart of *Goniobasis tenera* (Hall)¹¹ as defined by White.¹² His Wyoming, Colorado and Utah specimens figured, however, show some variations in sculpture which have not been found in the western form and the Rocky Mountain specimens are consistently larger; also, the diameter is greater as compared with the altitude.

STRICTLY FRESHWATER FORMS

5. *Sphaerium cynodon* Hanna, new species

Plate I, figures 4, 5, 6

Shell ovate, large and robust, almost equilateral, beaks full and elevated; anterior dorsal margin slightly concave, posterior convex. Right valve with two laterals anterior and two posterior, all about of equal height, dorsal ones placed opposite centers of ventral ones and channels between very deep to accommodate the high blade-like laterals of the left valve; right cardinal single, convex side uppermost, thickened posteriorly; left laterals, one posterior and one anterior, the latter being higher and less elongated than the former; left cardinals two, situated directly beneath the beak, the lower being the larger and having a triangular base.

¹⁰Bull. U. S. G. S. 396, p. 99, Pl. XXX, fig. 7, 1909.

¹¹Fremont's Rep. Ore. and N. Calif. p. 308, Pl. 111, fig. 6, 1845.

¹²3rd Ann. Rep. U. S. Geol. Surv. p. 464, Pl. 31, figs. 1 to 30.

Measurements

Length mm.	Height mm.	Half diameter mm.
11.	9.	3.5 (Type l. v.)
11.	9.	3.5 (Type r. v.)
12.	9.5	3.5 (Freak shell.)
13.5	10.5	4. (r. v.)
13.4	10.5	4. (l. v.)

Type: No. 514, Mus. Cal. Acad. Sci.

Type-locality: 417, Upper Miocene of Sonoma County, California.

The combination of characters found in this species cannot be matched with specimens and descriptions which are available. *S. cooperi* Arnold¹³ while having a somewhat similar shape has much lower beaks and the hinge and teeth are very different. It seems closer to that species, however, than to any other which has been adequately figured. The three species described by Hannibal,¹⁴ *S. rogersi*, *S. catherinæ* and *S. andersonianum*, from California Tertiary deposits were too poorly figured and too briefly described for the specific characters to be made out. Unfortunately, the same is true of some recent species.

6. *Pisidium curvatum* Hanna, new species

Plate I, figure 7; Plate II, figures 1, 2, 4

Shell trigonal in shape, beaks high and capped with the embryonic shell in some cases; hinge strongly arched, with the apex much to posterior of center of shell; anterior margin almost straight, posterior gently curved; right valve with two anterior and two posterior laterals, the former the larger, the space between each pair deep, to accept the high pointed laterals of the other valve; dorsal laterals long and narrow, ventrals high and pointed; the single right cardinal is anterior to the beak, high, bow-shaped, and placed symmetrically on the hinge; from its posterior dorsal border a well-marked ridge extends posteriorly in a straight line toward the hinge margin but does not meet it; this marks the lower border of the ligament attachment.

Left valve with single, high pointed laterals, anterior and posterior; cardinal teeth two, the anterior the larger and with tri-

¹³Bull. 396, U. S. Geol. Surv., p. 94, Pl. XXX, figs. 2, 2a, 1909.

¹⁴Proc. Mal. Soc. Lon. Vol. X, p. 131-132, Pl. VI, fig. 11, Pl. VII, figs. 20, 21, 1912.

angular base; posterior cardinal a low lamella extending backward parallel to a counterpart of the ridge mentioned as bounding the lower ligament attachment in the other valve.

Measurements

Length mm.	Height mm.
4.2	3.7 (Type r. v.)
4.4	3.9 (Type l. v.)

Type: No. 515, Mus. Cal. Acad. Sci.

Type-locality: 417, Upper Miocene of Sonoma County, California.

Ten specimens were found at the type locality. In shape the species is very much like the west American recent *P. compressum* Prime. The teeth in this, however, are much lower in specimens which are available for comparison; and the lower boundary of the ligament attachment area is marked by a bow-shaped ridge which meets the shell margin and has the convex side downward. A few other differences can be seen in the shells but it is believed these will be sufficient for segregation.

P. curvatum appears to be much like *P. supinum* Schmidt of Europe. The latter, however, has higher beaks if we may judge by Woodward's figures,¹⁵ and the hinge is heavier. The dorsal laterals are located above the centers of the ventrals in *supinum*, whereas they are almost directly opposite in *curvatum*.

Another name is added with reluctance to the long list in this genus, since synonyms must already be abundant. But a great many of the American forms have been described without illustrations, so that it is practically impossible to make identifications therefrom, while many of those described years ago and illustrated by wood cuts are but little better.

7. *Lymnæa petaluma* Hanna, new species

Plate II, figures 3, 7

Shell imperforate; spire elevated, conical, consisting of about four whorls which are but little rounded; surface malleated and marked with coarse growth lines on the body whorl; upper whorls irregularly marked with growth ridges. Columellar wall thickened and the callous deposit over the parietal wall broadened out; aperture not expanded. Interior of shell iridescent.

¹⁵Cat. Brit. Sp. Pis. Pl. XXVI, fig. 7, 1913.

Length of type, 22.5 mm; diameter, 14.5 mm. Original full dimensions of same specimen about 25 mm. by 16 mm.

Type: No. 516, Mus. Cal. Acad. Sci.

Type-locality: 417, Upper Miocene of Sonoma County, California.

This species belongs to the subgenus *Bulinna*, and is closely related to the living American species, *L. megasoma*, but has fewer whorls; whorls flatter on the spire, the columella more thickened and the callus over the parietal wall broader. The type has the spire broken away but a young individual is figured to show the characters.

The collection contains about 30 specimens from locality 417. All are more or less crushed and broken. Some were considerably larger than the type, but it is the most perfect.

8. *Lymnaea filocosta* Hanna, new species

Plate II, figure 5

Shell small, ovate, whorls $3\frac{1}{2}$, very convex; sutures deep; surface marked with fine even, close-set longitudinal riblets; spiral sculpture absent; aperture ovate; peristome thickened within; columella straight and reflected over the narrow umbilicus. Altitude, 3.5 mm.; diameter, 2.1 mm.

Type: No. 518, Mus. Cal. Acad. Sci.

Type-locality: 417, Upper Miocene of Sonoma County, California.

The species is similar in size to the recent *L. dalli* Baker,¹⁶ but that species has more whorls and they are shouldered; also the growth lines are uneven and inclined to be coarse. Four other specimens of *filocosta* from the type-locality show but little variation. *Lymnaea alamosensis* Arnold¹⁷ from the Pliocene of Los Alamos Valley, Santa Barbara County, California, is of undoubted close relationship, but it is larger, (six mm.) is more slender, and the whorls are less rounded.

9. *Lymnaea kerri* Hanna, new species

Plate II, figure 6

Shell long and slender, conical, apex slightly obtuse; composed of a little over four whorls which are only slightly rounded. Surface

¹⁶Naut. XX, p. 125, 1907. Monog. Lym., p. 251, Pl. XXX, figs. 13-18, 1911.

¹⁷Bull. 322, U. S. Geol. Surv., p. 59, pl. XXI, figs. 6, 7, 1907. (No description.) Arnold Smith. Misc. Coll., Vol. L, Quarterly Issue Vol. IV, pt. 4, p. 430, pl. LIV, figs. 6, 7, 1908. Baker, Mon. Lym. North Am., Chicago Acad. Sci., Spec. Pub. No. 3, p. 104, pl. XV11, figs. 9, 10, 1911.

glossy, marked by delicate lines of growth crossed by minute spiral striæ, only visible under considerable magnification; aperture ovate; peristome thin; columella swollen inside, broadly reflected, partially concealing the umbilicus when viewed from directly in front. Altitude, 4.2 mm.; diameter, 2.3 mm.

Type: No. 519, Mus. Calif. Acad. Sci.

Type-locality: 417, Upper Miocene of Sonoma County, California.

Only one specimen was found in the material collected. It is a perfect shell, although broken and slightly displaced in being mended. Its glossy surface with spiral sculpture seems to indicate that we are here dealing with a relative of *Lymnæa*(?) *limatula*, but sufficient material is not available to definitely decide the point. The species apparently does not approach closely any living American *Lymnæa*.

Named for Mr. J. B. Kerr who collected the material.

10. *Lymnæa* (?) *limatula* Hanna, new species

Plate II, figures 8, 9

Shell acutely conical, smooth and glossy, highly polished. Whorls, $5\frac{1}{2}$, very slightly rounded; sutures weak; surface marked with fine growth lines and fine spiral striæ which, under high magnification, appear as a satiny sheen; aperture long and narrow, acutely angular above; columella straight, reflected over the very narrow umbilical perforation; peristome thin. Altitude, 9.9 mm.; diameter, 4.5 mm.; length of aperture, 5 mm.

Type: No. 520, Mus. Cal. Acad. Sci.

Type-locality: 417, Upper Miocene of Sonoma County, California.

This shell may not be a *Lymnæa*. Its characters suggest strongly such genera as *Ferrusacia* and *Obeliscus* of the *Achatinidæ*, but the type is a little too poorly preserved to warrant its separation as a distinct genus, or the placing of it in a group hitherto unknown in North America. Therefore, until better specimens are found, it seems best that it be retained under *Lymnæa* with a question.

One other adult shell besides the type was found but it also has been badly crushed. There are also eight small shells from the same locality which have the same form of sculpture and are

believed to be young of this species. One of them is figured in order to show the character of shell at that age. It will be seen that the aperture of this differs materially from that of the type. The broken columella of the type, however, gives a false impression of the shape as it actually existed. The young shell shows a heavy callus over the parietal wall; this has apparently been lost in the type specimen.

The species bears a suspicious resemblance to the fossil described as *Bulimus limnæiformis* Meek & Hayden,¹⁸ and which was later placed in the genus of land mollusks, *Thaumastus* Albers, by Meek.¹⁹ It came from the Laramie Group of the upper Missouri River.

11. *Lymnæa contracosta* (?) Cooper

At locality 418 several specimens of a large *Lymnæa* were collected. They appear very much like the figures of *L. contracosta*,²⁰ a very imperfectly known form. All of the specimens are too badly crushed for a positive identification to be made.

12. *Physa* sp.?

At locality 418 there was collected a single young shell of a *Physa* which cannot be identified specifically. The absence of this well known genus in the other deposits of Sonoma County is very noteworthy.

13. *Planorbis pleioleurus* Hanna, new species

Plate III, figures 1, 2, 3

Shell widely umbilicate, discoidal, spire about equally depressed above and below; surface ribbed both above and below, the ribs varying slightly in height and distance apart; periphery obtusely angulated; whorls slightly more than three; last half of last whorl depressed slightly below the one preceding but the aperture is not abruptly deflected. Altitude, 1.2 mm.; diameter, 3.2 mm.

Type: No. 521, Mus. Cal. Acad. Sci.

Type-locality: 417, Upper Miocene of Sonoma County, California.

¹⁸Proc. Acad. Nat. Sci. Phila. Vol. VIII, p. 118, 1856.

¹⁹U. S. G. S. Terr. Vol. IX, p. 553, Pl. 44, fig. 8, a, b, c, d, 1876.

²⁰Cooper, Proc. Calif. Acad. Sci., ii, Vol. IV, Pl. XIV, fig. 12, 1894. Baker, Mon. Lym., Pl. XVII, fig. 12, 1911.

This minute form belongs to the *P. parvus* group of living species. The coarse sculpture and obtusely angulated periphery distinguish it. Eight specimens were collected at the type locality. Almost all are perfect and show very little variation in size, shape and sculpture.

14. *Planorbis plenus* Hanna, new species

Plate III, figures 4, 5, 6

Shell widely umbilicate, discoidal, last whorl depressed, making the width of the spire less below than above; surface evenly sculptured with delicate striæ above and below; whorls $3\frac{1}{2}$, almost circular in cross section.

Measurements

Altitude mm.	Diameter mm.
3.5	7.5 (Type)
3.7	8.5
3.	7.

Type: No. 522, Mus. Cal. Acad. Sci.

Type-locality: 417, Upper Miocene of Sonoma County, California.

The 25 specimens in the collection from the type-locality show little variation. In the type there is an enlargement near the last of the last whorl, probably indicative of a period of rest during development; it is absent in some senile individuals which contain over four whorls. The species appears unique among United States planorbs, although there is a superficial resemblance to the toothed genus, *Segmentina*. Its closest relative seems to be *Planorbis cornu* Bourg., of European Upper Miocene.



Fig. 1. *Corbicula gabbiana* Henderson, inside of right valve, X 1; Fig. 2. *Corbicula gabbiana* Henderson, inside of left valve, X 1; Fig. 3. *Goniobasis rodeoensis* (Clark), a, b, c, d, various forms of sculpture from locality 415, e, f, shells from locality 417, X 3; Fig. 4. *Spharium cynodon*, new species, type, interior of right valve, X 4; Fig. 5. *Spharium cynodon*, new species, type, interior of left valve of freak shell, X 4; Fig. 6. *Spharium cynodon*, new species, type, interior of left valve and exterior of right valve, X 4; Fig. 7. *Pisidium curvatum*, new species, type, interior of left valve, X 10.

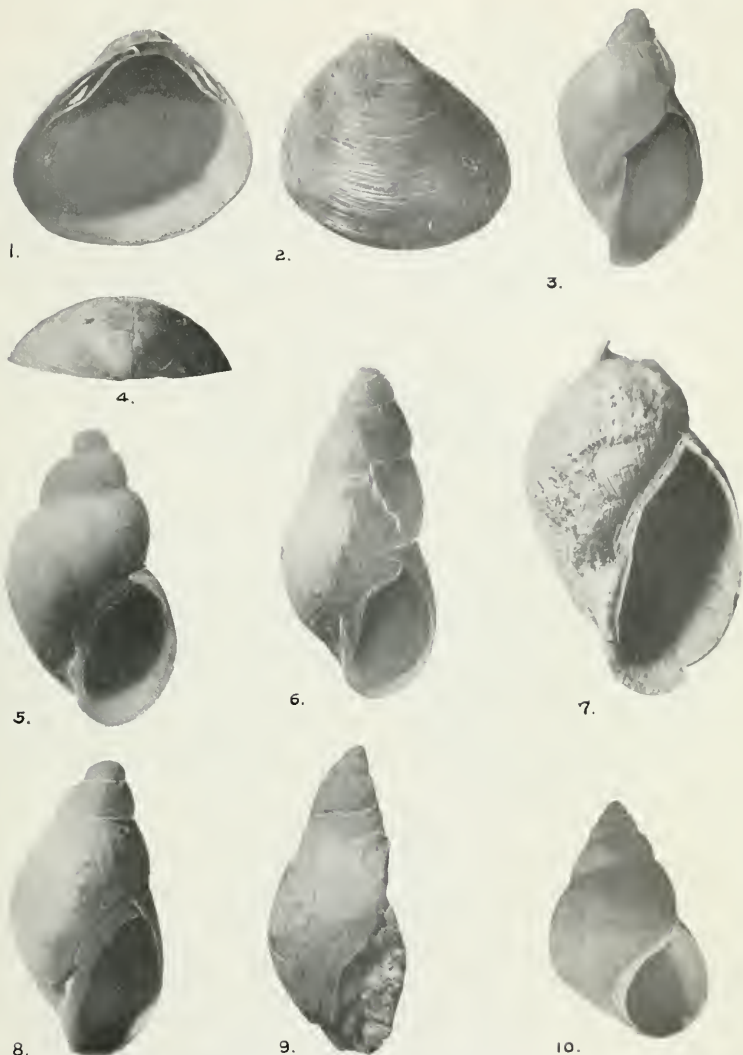


Fig. 1. *Pisidium curvatum*, new species, type, interior of right valve, X 10; Fig. 2. *Pisidium curvatum*, new species, type, exterior of right valve, X 10; Fig. 3. *Lymnaea petaluma*, new species, young shell, X 5; Fig. 4. *Pisidium curvatum*, new species, type, vertical view, X 10; Fig. 5. *Lymnaea filocosta*, new species, type, X 15; Fig. 6. *Lymnaea kerri*, new species, type, X 15; Fig. 7. *Lymnaea petaluma*, new species, type, X 3; Fig. 8. *Lymnaea (?) limatula*, new species, young shell, X 15; Fig. 9. *Lymnaea (?) limatula*, new species, type, X 5; Fig. 10. *Nematorella euzona*, new species, type, X 8.5.



1.



2.



3.



4.



5.



6.

Fig. 1. *Planorbis pleioleurus*, new species, type, X 15; Fig. 2. *Planorbis pleioleurus*, new species, type, X 15; Fig. 3. *Planorbis pleioleurus*, new species, type, X 15; Fig. 4. *Planorbis plenus*, new species, type, X 8.5; Fig. 5. *Planorbis plenus*, new species, type, X 8.5; Fig. 6. *Planorbis plenus*, new species, type, X 5.

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IV

**NOTES ON SOME LAND SNAILS OF THE SIERRA
NEVADA MOUNTAINS, WITH DESCRIPTION OF A
NEW SPECIES**

BY G. DALLAS HANNA AND EMMET RIXFORD

In order to gather definite information regarding some little known species of land snails of the California Sierra Nevada two trips were made by us to these mountains in 1921. We went first to Columbia in Tuolumne County and searched for one day and a part of another for *Epiphragmophora circumcarinata* (Stearns). Columbia is said to be the type locality of this rare form, known in the field only to its discoverer, Crawford. We did not find it but we secured much valuable material of the *E. mormonum* group. In fact, this material made it apparent that a trip to the type locality of *mormonum* would be necessary.

This led us to Mormon Island in Sacramento County, on the second trip. After we had secured an abundance of specimens of *mormonum* there, it became very evident that a revision of this difficult group of snails could not be attempted until much more collecting had been done at other places. With very considerable series of specimens already available, it appears probable that, to the north, *mormonum* passes into *fidelis* by imperceptible gradations, while to the south and west the series can possibly be connected directly with such diverse forms as *dupetithouarsii*. It is hoped that this remarkable situation can be fully exposed after two or three more years of collecting.

At Mormon Island a species of *Polygyra* was discovered, which appears to be new, and on the same trip we found *Ammonitella yatesii* Cooper at its type locality in Calaveras County. Our notes on these forms are offered herewith because it does not seem desirable to withhold them indefinitely while field work progresses on other subjects.

Ammonitella yatesii Cooper

Plate IV, figures 4, 5, 6, and 7

In 1869, J. G. Cooper¹ created the genus *Ammonitella* to contain a very odd species of land snail which was discovered in Calaveras County, California, by Lorenzo G. Yates after whom the species was named. The genus received its name because of its superficial resemblance to an ammonite. It also resembles *Planorbis* to a remarkable degree. Dr. Cooper remarked that if the evidence had not been conclusive of its being a land snail, it surely would have been taken for a freshwater form.

Indeed, it happened that no less authority than Timothy A. Conrad was misled by this resemblance the following year when he described the Oregon fossil, "*Planorbis lunatus*."²

Ammonitella yatesii remains to this day one of the rarest of our good species of snails. So far as the available records show, it has, until now, been collected but once since its original discovery. This was by the veteran, Henry Hemphill, as might be expected. He went to the type locality especially for it and has given us an account of his experiences in the rare publication "*Zoe*."³ Until he visited the region, it had been surmised that the species was a cave dweller. He collected considerable numbers of specimens at Cave City and at Murphy's, six miles away. The original collection of Yates contained but five specimens. James H. Ferriss has not recorded it from further south in the Sierra,⁴ and it would be hard, considering his reputation, for us to believe he had missed it. S. N. Lowe⁵ did good work both north and south of the known range of the species but failed to find it. For these reasons we are led to suspect that it is confined to the limited limestone and marble region in the eastern part of Calaveras County. And it seems likely that it is associated in some manner with the caves, although it does not actually live within them. There is also a cave at Murphy's although Hemphill did not mention it.

¹Am. Journ. Conch. Vol. IV, p. 209, 1869.

²The full synonymy of this species has been given in Univ. of Oregon Publ. Vol. 1, No. 6. August, 1920.

³Vol. III, p. 45, 1892.

⁴*Nautilus* Vol. XXXI, p. 33, July, 1917.

⁵*Nautilus*, Vol. XXX, p. 95, Dec. 1916.

Very uncertain has been the relationship of the species and genus as interpreted by various conchologists. Cooper thought it a distinct genus. Binney, however, did not consider it different from the European *Gonostoma*,⁶ and stated that the animal was "as in *Patula*;" this would place it in the family Endodontidæ as now recognized. Pilsbry⁷ placed it in *Polygyrella* (*Helicidæ*) on dentition and shell characters while Hemphill thought it a "*Helix*." Specimens in the University of California Collection are labeled "*Anchistoma*." Thus this species has been placed in at least five different genera in 50 years, a change, on the average, of once every 11 years. Much of this uncertainty has resulted from the remarkable form of the shell and the fact that the soft parts have been unknown.

Cave City is an old, abandoned mining camp. A single dilapidated shack and a concrete dam across the creek recall the activities of other days. It is 10 miles east of San Andreas, and some of the road leading there is very bad. Emmet Rixford, Jr., soon located the unmarked cave about a quarter of a mile up stream from the dam on the west bank of the north fork. It had once been prepared for exploitation but the walks and walls leading to it are brush and grass-grown, and its wooden door has rotted and collapsed. The entrance is narrow and could be easily overlooked. It enters a deposit of white marble and has brown stained stalagmites and stalactites from the beginning.

Our first search led us inside of the cave where we looked under the loose stones, boards and in the humus which is gathered on the floor. A few dead shells of *Epiphragmophora mormonum* were all that rewarded us. The ammonitellas were soon found, however, immediately outside of the entrance, under moss-laden stones. Here we found them alive and dead in abundance. Buckeye trees cast a dense shade over the place. The animals were not aestivating, yet all of them were retracted within their shells when found. We did not find any at a depth greater than one foot beneath the surface; 40 yards away from the cave they could not be located in the brief time at our disposal, although conditions there appeared equally favorable. In an hour the three of us secured 80 alive and 180 dead. *E. mormonum* was abundant with them but no other species was seen.

⁶Man. Am. Ld. Shells, p. 113, 1885.

⁷Man. Conch. Vol. IX, 2nd ser., p. 80, 1894.

The finding of these animals alive gives a long-looked-for opportunity to study the anatomy. Externally they are pale, translucent-gray with dark bands dorsally where the optic retractor muscles show through. The skin has a delicate reticulation; pedal grooves are absent which definitely excludes the species from the Endodontidæ. The tail is acutely pointed and keeled in the median line above. No caudal mucous gland could be found. If the species were a cave dweller the eyes would be expected to be functionless or absent, but they appear normal in every respect. This is likewise true of the nerves which lead to them. The animal is very timid and retracts within its shell upon slight provocation.

The genitalia are of the usual type of American Helicidæ of the Polygyra group, as shown by the accompanying figure. The vas deferens and hermaphroditic duct are entirely without convolutions. The spermatheca in the specimens examined, was located just beneath the heart; therefore, the duct was very long and slender.

Jaw widely arched and marked with transverse ribs. Three specimens examined had 15, 26 and about 35 respectively. Binney³ has figured one with 13 ribs and states that the number is "about 12." Such variation illustrates the little value which can ordinarily be placed in the ribbing of this organ in the classification of species.

The mantle is marked by a series of black spots of uniform size which do not coalesce or join to form blotches as is usual in Polygyra; and they do not extend to the right as far as the intestine which is darkened by minute pigment specks.

The kidney is a triangular pouch at the upper end of the pallial cavity and the urethra bends back upon it from the outer point before it bends to the right to meet the intestine.

It thus becomes apparent that *A. yatesii* belongs to the Helicidæ and the anatomy presents no such radical departure as the shell. There seem to be no anatomical reasons for considering the genus distinct unless it be in the attachment of the penis retractor muscle to the floor of the mantle cavity. The shell, however, differs so essentially from all others that we seem justified in considering it to belong to a distinct genus. Many groups have been separated upon much less definite grounds.

³Man. Am. Ld. Sh. p. 113, 1885.

The affinities of the genus appear to be with *Polygyrella* as Pilsbry foresaw; and both genera are not distantly removed from the polygyras of the *germana* and *loricata* groups.

The enormous length of time the genus has been in existence is very remarkable. The fossil, *A. lunata* (Conrad), is abundant in the John Day Basin strata of central Oregon which are supposed to be of Oligocene age. That form differs little from *A. yatesii*; in fact, Stearns considered them so close that he made the fossil a subspecies (*præcursor*), overlooking the fact that Conrad had previously named it. Whole families, even orders, of mammals have completely died out of the region in the meantime, yet our little land snail has barely changed specifically. Considerable speculation on the rate of evolution in the various groups of animals might well be prompted by a further careful comparison of such facts as these.

***Polygyra penitens* Hanna & Rixford, new species**

Plate IV, figures 1, 2, 3, and 8

Shell dark brown when alive, aperture with a violet tinge; a little more than five well-rounded whorls; spire about evenly rounded above and below; uppermost two or three whorls smooth, remainder, hirsute; hairs in rows which follow the growth lines and fairly evenly spaced so that they are also in irregular, diagonal rows; individual "hairs" are in reality flat, lammella-like projections of epidermis; umbilicus very wide, contained only four times in greatest diameter of shell; apertural teeth three; all weakly developed for this group of *Polygyra*; palatal and basal, rounded tubercles; parietal somewhat lamellar but not curved as in many species of the genus; peristome reflected but not so abruptly as in the *P. devius* group.

Numerous specimens were found on the south bank of the south fork of American River near the hamlet, Mormon Island, Sacramento County, California. The locality is about $\frac{1}{8}$ mile west of the road which leads north at that point and just before the wagon bridge is reached. It is $1\frac{1}{2}$ miles east of Folsom Penitentiary; this proximity suggested the name *penitens*. American River at this point is a swift, narrow, rocky stream and the snails were found living among rocks and plant debris on a dry but

shady hillside. *Epiphragmophora mormonum* and *E. tudiculata cypreophila* were associated with them.

Diameter mm.	Altitude mm.
7.9	3.5 Fig'd type
8.0	3.2 Fig'd paratype
8.0	3.5 Fig'd paratype

Type: No. 692 and two paratypes, No. 693, Mus. Cal. Acad. Sci. Eighteen other specimens, No. 21,610, Systematic series, Mus. Cal. Acad. Sci. Other specimens are in the Rixford Collection.

Type-locality: Mormon Island, Sacramento County, California.

This species is closer related to *Polygyra roperi* (Pilsbry)⁹ than any other. That species is hirsute and has a wide umbilicus, but is less elevated (it was described as subdiscoidal), the whorls increase less rapidly in size, the constriction is less marked behind the aperture and the aperture is less oblique. The palatal tooth in *penitens* is rounded-tubercular, not quadrate as in *roperi*. The basal tooth is nearer the center of the basal margin in *penitens*, and the parietal tooth is not long and curved as in *roperi*. But the greatest difference between the two species lies in the character of the epidermis. *P. roperi* is truly hirsute, the projections being actual hairs, although short; in *penitens* they are flat and lamella-like.

The comparison of the species has been made possible through the courtesy of Dr. Henry A. Pilsbry of the Academy of Natural Sciences of Philadelphia where two specimens of the rare *P. roperi* are preserved. Both species appear to be related to *Polygyra loricata*; but that form does not have the very wide umbilicus and the hirsute epidermis is not so well developed.

Another species which bears a superficial resemblance to *P. penitens* is *Polygyra harfordiana*¹⁰ (W. G. Binney). (Not *Poly-*

⁹Nautilus, Vol. III, p. 15, figs. 1889. Binney, 3rd suppl. etc. Bull. XIX, Mus. Comp. Zool., p. 212, fig. 1890.

¹⁰Binney first used the name *harfordiana* with the genus *Triodopsis*. (Terr. Moll., Vol. V. Bull. IV, Mus. Com. Zool., p. 309 name only, no description, pl. VIII, fig. R and text fig., 1878. Described in 2nd Suppl. to same, Bull. XIII, Mus. Comp. Zool., p. 37, pl. I, figs. 6, 7, 1886.) Cooper however, described his shell as *Dadalocheila harfordiana*. (Am. Journ. Conch., Vol. V, p. 196, pl. XVII, fig. 8, 1869.) Since the two species were originally described under different genera, and are now considered to belong to different genera, Binney's name appears to be the proper one. The rule "once a synonym always a synonym" can hardly apply in such an instance. Therefore, the substitute names for Binney's species, *Helix salmonensis* Tryon (Man. Conch., Vol. III, 2nd ser., p. 146, 1887), and *Helix commutanda* Ancey (Conchologist's Exchange, Vol. II, p. 79, 1887) should be discarded.

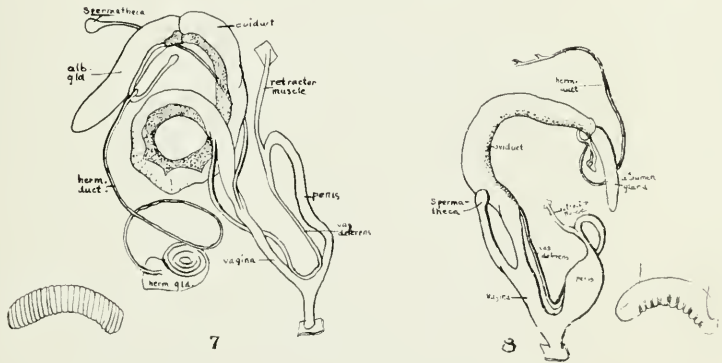
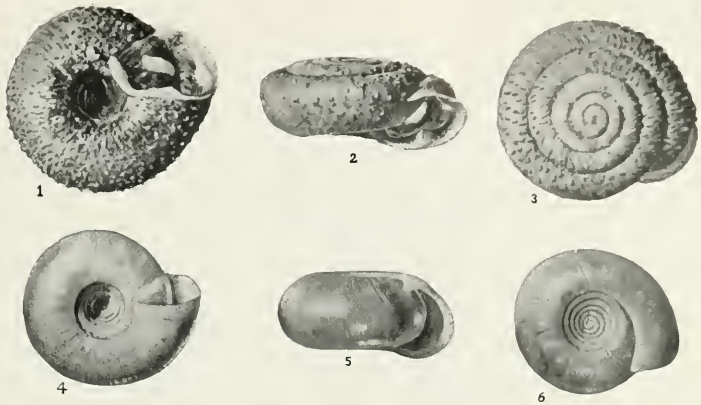
gyrella harfordiana (J. G. Cooper.) That species is described in one place as being "sparsely hirsute" and on the following page, "scarred as if it had been hirsute." The specimens were collected by Henry Hemphill on Salmon River, Idaho, and three labelled by him, "Original lot," are in the collection of the California Academy of Sciences. These are not, properly speaking, hirsute; they are smooth and shining as many other forms of the *Polygyra devius* group, but they are slightly pitted on the surface. Moreover, although Binney gives the diameter and altitude of his *Triodopsis harfordiana* as "8" and "3" mm. respectively, the smallest of the three specimens referred to measures 8.7 mm. by 4.4 mm. And, while the umbilicus is wide, it is not proportionately as wide as in *roperi* or *penitens*. In fact it appears from careful study that *Polygyra harfordiana* (W. G. B.) is a dwarfed variation of some member of the *Polygyra devius* group. All of these seem to have the peristome abruptly reflected and the palatal tooth, when present, not set within the aperture. The aperture, moreover, is almost, if not quite, in a plane when looked at toward the axis. In the *loricata* group it is not in a plane and the palatal tooth is set slightly within the margin. Among typical members of the two groups there is great difference in size but this can be bridged in large series as Hemphill did when he discovered *sanburni*, *harfordiana*, and some others.

Hemphill collected a series of specimens near Healdsburg, Sonoma County, California also, which he described under the name, "*Helix* var. *sonomaensis*."¹¹ The type lot consists of five shells which now form No. 8041, of the Museum of the California Academy of Sciences. The original label calls it a subspecies of *loricata*. Hemphill's generalized description hardly does justice to what appears to be a perfectly good species. He did not mention the characters which are so obvious through the microscope. The species has a wider umbilicus than is usual in *loricata*, but it does not approach the deeply-reamed cavity of *roperi* or *penitens*.

The finding of some of the snails at Mormon Island alive enables us to figure the genitalia. In all essential respects the usual characters of the genus are exhibited. The jaw has 10 flat, faintly indicated, transverse ribs in the type specimen.

¹¹Trans. San Diego Society of Natural History, Vol. 1, No. 3, p. 101, 1911.

This makes the fourth species of the *loricata* group. One is very widely distributed in northern California, but the other three are extremely localized. *P. roperi* was first found in 1889 at Redding, California, and has been found there once since and there only. The new species was found at the type locality only, in spite of a considerable amount of collecting which was done in various other portions of the Sierra foothills.



Figs. 1, 2 and 3, *Polygyra fenitens* Hanna and Rixford, new species; Figs. 4, 5 and 6, *Ammonitella yatesii* Cooper; Fig. 7, jaw and genitalia of *Ammonitella yatesii*; Fig. 8, jaw and genitalia of *Polygyra fenitens*.

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V

A NEW SPECIES OF *CARYCHIUM* FROM VANCOUVER
ISLAND, BRITISH COLUMBIA

BY G. DALLAS HANNA

Curator, Department of Invertebrate Paleontology

Union Bay, Vancouver Island, British Columbia, is a coaling station where ships often call prior to a cruise to the northward. I happened to visit the place in this manner in April, 1916, and took advantage of the opportunity to collect some land snails in the heavy timber back of the settlement. Among other interesting species there was found a *Carychium* which does not appear to have been described.

Carychium magnificum Hanna, new species

Shell white or translucent; whorls five, gradually increasing in size to the last making the shape more decidedly conical than in any other North American species. Sutures deep; growth lines weak; delicate revolving striæ in the type and most specimens. Aperture with the peristome reflected abruptly but without heavy callus on the inside; shorter and broader in proportion to altitude of shell than in *exiguum*. Parietal tooth near the columellar wall and forming outer termination of a high-revolving axial plait (shown in the paratype, which was broken open for the purpose). A low basal protuberance which also continues within the shell as an axial plait but it is lower than the preceding. The axis is dissolved out of the upper three whorls. Altitude, 2.30 mm.; diameter, 1.13 mm. Bulk of shell fully twice as great as that of *C. exile canadense* which was found under the same log.

Type: No. 689 and paratype No. 690, Mus. Cal. Acad. Sci. Fifty-nine paratypes No. 18,567, systematic series, Mus. Cal. Acad. Sci.

Type-locality: Union Bay, Vancouver Island, British Columbia.

This species is undoubtedly closest related to *C. occidentalis* Pilsbry,¹ which was described from Portland, Oregon, and has been recorded from Seattle, Washington.² The shape of the two species is about the same and both are without thickening on the inside of the peristome. Measurements of *C. occidentalis* have not been published but the figures cited are upon a plate where other known North American forms appear. Presumably, all were drawn to the same scale. If so, there is no great difference between *occidentalis* and *exiguum* in size. This appears the more reasonable since no mention of a larger size is contained in the original description of the former. It was distinguished from

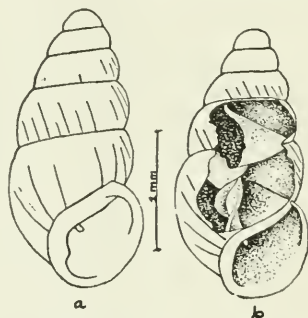


Fig. 1. *Carychium magnificentum* Hanna, new species; a, type: No. 689; b, paratype: No. 690; Mus. Cal. Acad. Sci.

exiguum by a more distinctly conical shape, larger and more oblique aperture, and outer lip not thickened. The large size of *C. magnificentum* is its most distinguishing feature but the spiral striae have not been seen in other species. *C. exile canadense*, which was found with it, is much narrower and a little shorter. It is larger than any previously known species. The two revolving axial plaits have been found in all species which were examined, but in *C. magnificentum* they are higher than in the others. The dissolving

¹Nautilus, IV, 109, 1891. Proc. Acad. Nat. Sci. Phila. 1891, p. 318, pl. XIV, figs. 4, 5, 6. Nautilus, VIII, p. 63, figs. 4, 5, 6, 1894.

²Randolph, Nautilus, Vol. IX, p. 102, 1896.

away of the axis in the upper three whorls seems to be a generic character.

The differences in size are best shown in the form of a table as follows:

	Altitude		Diameter
	mm.	mm.	
<i>Carychium magnificum</i>	2.30	1.13	Type
<i>Carychium magnificum</i>	2.50	1.4	Maximum
<i>Carychium exiguum</i>	1.75	.75	Average*
<i>Carychium exiguum</i>	2.15	.85	Maximum*
<i>Carychium exile</i>	1.75	.6	Large average*
<i>Carychium exile canadense</i>	2.1	.75	Types*
<i>Carychium stygium</i>	2.00	.85	Cotype*
<i>Carychium nannodes</i>	1.4	.6	Type**
<i>Carychium occidentalis</i>	1.75?	.75?	By inference.

*Clapp, Nautilus, Vol. XIX, p. 138-140, pl. VIII, figs. 1-10, 1906.

**Clapp, Nautilus, Vol. XIX, p. 91, pl. III, figs. 7, 8, 9, 1905. The subspecies, *C. exile jamaicensis* Filsbry and *C. exiguum mexicanum* Filsbry, are approximately the size of the species to which they were attached, if one may judge the figures correctly; measurements have not been published. The references cited for *C. occidentalis* apply to these as well.

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VI

EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921

GENERAL ACCOUNT

BY

JOSEPH R. SLEVIN

Assistant Curator of Herpetology

The California Academy of Sciences has long considered the Peninsula of Lower California and the adjacent islands as constituting one of its principal fields for exploration and research. Prior to the loss sustained by the fire of 1906 the Academy had large and valuable collections from that region. Efforts have been made to replace those collections and in 1919 field work was carried on in the "Cape Region" of Lower California, where considerable collections were obtained.

In 1921, the Academy was able to send an expedition to the Gulf of California. The purpose of this expedition was to make as comprehensive and thorough study of the fauna and flora of the islands in the Gulf, and of localities on the adjacent mainland, as time, funds, and weather conditions would permit. This would include, of course, the making of as extensive collections in the various groups as possible.

To enable this object to be accomplished, the Academy chartered the gasoline schooner *Silver Gate*, Capt. John Ross. The *Silver Gate* is 64.5 feet over all, 15 feet beam, 22 tons,

June 2, 1923

capable of making eight knots, had a cruising radius of 2000 miles, and carried a crew of four men.

The personnel of the expedition was as follows: Joseph R. Slevin, assistant curator of herpetology, in charge; Edward P. Van Duzee, curator of entomology; Dr. Fred Baker of Point Loma, Calif., representing the department of paleontology; Virgil W. Owen of Los Angeles, representing the department of ornithology and mammalogy; Ivan M. Johnston of the University of California, representing the department of botany; Joseph C. Chamberlin of Stanford University, assistant to Mr. Van Duzee; Señor Francisco Contreras and Señor Carlos Lopez of the Museo Nacional de Mexico, representing that institution; and Capt. John Ross in command of the *Silver Gate*.

Messrs. Slevin and Chamberlin sailed from San Francisco for Guaymas on the motor ship *Mazatlan*, April 3. At San Pedro, Calif., they were joined by Messrs. Baker, Johnston and Owen, and arrived at Guaymas April 13, where they were joined by Mr. Van Duzee who had gone down from San Francisco by rail, and by Señors Contreras and Lopez. All reported on board the *Silver Gate*.* Stores and equipment were taken on board on the 14th and 15th, and at 4:40 P. M. of the 16th, departure was taken for San Carlos Bay, coast of Sonora, and to anchor for the night, and to shorten the run to the first island to be visited. The real work of the expedition began on April 17, when a landing was made on San Pedro Nolasco, a small volcanic island about two miles long and three-fourths of a mile wide. The landing place is given as on the S. E. side but the high bluffs back of the beach at this point make it impossible to reach the top of the island. By cruising along the eastern shore, a place was found at the N. E. end, opposite a small cañon, which is partly sheltered from the N. W. winds where a landing can be made only in fine weather.

Although a steep and rough climb, the top of the island may be reached from this point. A large colony of brown pelicans

*One of the most pleasant features of the expedition was the very cordial relations between the representatives of the Academy and the Mexican officials and others with whom the expedition came in contact. Señors Contreras and Lopez were always gracious and anxious to assist in making the work a success, as were the officials at the various places where landings were made. The grateful appreciation of the Academy of the many courtesies received is hereby expressed to all who so kindly contributed to the success of the expedition.

was found at the head of the cañon, and many large rock iguanas (*Ctenosaura*) were sunning themselves upon the tops of the large boulders. A day was spent here, the vessel lying off while the party was ashore.

Departure was taken early in the evening, and San Pedro Martir Island, a small triangular barren rock, was reached at daybreak next morning. The island is less than a mile in length and about 1000 feet in height. It was formerly a great sea-bird rookery but appears to have been long deserted, probably due to the depredations of the guano hunters. Good anchorage is to be found opposite a high bluff on the east side, but the landing must be made on the south side where the rock slopes down to the water's edge. The island is occasionally visited by fishermen and sealers. A party of the latter was found camped on the beach at the time of our visit.

After a day's stop here, the expedition continued northward, and on April 19 anchored off a large valley on the east side of San Esteban Island. The country was extremely rough, and dry, and cut up into small washes and cañons not unlike some of the country in our own southern deserts. One is at once struck by the great number of immense chuckwallas (*Sauromalus*) on San Esteban scattered about in the cactus patches, and by the large rock iguanas (*Ctenosaura*) sometimes seen sunning themselves on the tops of the giant cacti.

A stop of two days being made here, departure was taken for Isla Raza, a small low rocky island about three-fourths of a mile long, on which a landing was made on the morning of April 21. It was hoped to find here the eggs of Heermann's gull. The birds were found by the thousands scattered over the island, but evidently the nesting season was not in full swing as only a few sets of eggs were found. The itinerary was changed here in order to make another visit at a little later date, and owing to the poorly protected anchorage from the strong N. W. winds blowing over the top of the island, a run was made four and a half miles to the northwest and anchorage made under the lee of Isla Partida, which consists of two small peaks connected by a low isthmus, the whole being a little over a mile long and about half a mile wide. It affords good anchorage from both northerly and southerly winds. A rock slide was found on the eastern slope of the southern peak

where many black petrels and least petrels were nesting, and which was inhabited by hundreds of bats.

During the night of April 22, the run to Tiburon Island was made and on the morning of April 23 the expedition arrived at Freshwater Bay where it was met by a hunting party of Seri Indians under their chief, Chickorito Romero. Tiburon is the hunting ground of the Seris who have long been looked upon as cannibals and a very warlike tribe, and we hear even today of the dangers and risks taken by landing on the island. However, stories about their cannibalism are mere echoes of old legends and certainly have no foundation in fact. They are truly savage in their mode of life, and perhaps would be dangerous if intoxicated, but there is no danger in visiting the island, if a party is well armed and keep together. The Seris have their main camp at Las Cruces on the mainland and cross the narrow channel to the island in dugout canoes. They are very fleet of foot and are said to be able to run down a deer. Their only shelter is a little wind break or mere semblance of hut made of brush, and their food consists of fish, turtles, pelicans and what deer they can shoot. We were informed, that, when possible, they cook their food, but are not a bit averse to eating it raw. On camping trips, water is carried in deer bladders. The party met had two or three guns, and a few cartridges, and were very anxious to obtain more. We gave them presents of old clothes, fish hooks, hardtack, cigarettes and a can of water. In order to avoid their visiting the *Silver Gate*, a run was made to an anchorage under the lee of Patos Island, a small low island five miles off the north end of Tiburon. We remained at anchor till the evening of April 24, riding out a heavy N. W. wind, and late in the evening sailed for Tepoca Bay on the Sonoran coast which was reached early next morning. A day's stop was made here, and the expedition continued along the low sandy coast on which it was found impossible to land on account of the heavy N. W. winds till early in the afternoon of April 26 when Georges Island, the most northern point visited by the expedition, was reached. This island is a barren rock less than a mile in length and a little over 200 feet in height. It is the nesting site of thousands of sea birds, and on a little flat at the north end was found

a very large colony of royal and elegant terns. Eggs were found in all stages of incubation. Other birds found nesting about the island were, red-billed tropic-bird, western gull, Heermann's gull, Brewster's booby and blue-footed booby. The island was at one time worked for guano.

On the evening of April 27, the *Silver Gate* started on the longest run of the cruise, across the Gulf to San Luis Island, a distance of 87 miles. On anchoring at San Luis in the morning, the wind was blowing so strong that it required two men to pull the skiff against it and sweeping around the cliffs, hurled great clouds of volcanic dust in the air. It was this that probably led to the rumors at various times that the island was in eruption. It is one of the most barren and rugged islands in the Gulf, covered with great streams of lava and volcanic ash. It was here that the largest colony of brown pelicans found on the trip was encountered, numbering several thousand birds. Anchorage was made for the night in San Luis Gonzales Bay, owing to the high winds at San Luis Island. San Luis Gonzales Bay affords excellent anchorage, but the surrounding country is very dry, barren, and uninteresting.

The morning of April 30, the expedition reached Puerto Refugio at the north end of Angel de la Guardia Island, the largest in the Gulf. It affords excellent anchorage and is protected from all winds, being sheltered on the north and west by Mejia Island, on the east by Granite Island, and on the south by Angel de la Guardia. From this anchorage, Mejia, a small rough volcanic island cut up by steep rocky cañons and notable for the abundance of large black chuckwallas (*Sauromalus*), was visited, as was also Granite Island, a small chain of granite peaks somewhat similar to Georges Island and the nesting site of a number of birds, notably brown pelicans, reddish egrets and ospreys. Angel de la Guardia, the third island visited, from here presented a very rugged appearance, and just to the southward of the bay rose several barren sharp ridges terminating in peaks some 2000 to 3000 feet in height. A large valley with several dry washes running into it extends across the island from east to west. The entire north end of the island is particularly barren and land birds are very scarce.

On May 4, Isla Raza was visited a second time for the purpose of securing the eggs of Heermann's gull which we failed to get on the first visit, April 21. Two Mexican sloops were found with parties ashore gathering the eggs for the markets of Santa Rosalia and Guaymas. The eggers go over the island twice a day, sweeping it clean, and it was with difficulty that a few complete sets were secured. It is hoped that the report of Señor Contreras to the Mexican Government will help to put a stop to this practice and prevent the birds from being driven from their nesting grounds.

Angeles Bay on the Peninsula, the next anchorage made, was formerly the site of a small settlement belonging to the San Juan mine situated some distance in the interior. At the time of our visit, the tides were favorable for beaching the vessel so the opportunity was taken to put the *Silver Gate* on the beach to repair the rudder and paint the bottom, which operation required about two days. The vessel was also watered here from a small spring, yielding about 25 gallons per hour, which was situated about a quarter of a mile from the beach. The location of the spring is easily detected by a small grove of palm and cottonwood trees which can be seen some distance off shore. Angeles Bay affords excellent anchorage with a fine sand bottom, but small boats may be troubled by the strong winds that sometimes blow off the surrounding mountains.

On May 7, Las Animas Bay was reached, where good anchorage was found and a much needed rest enjoyed by all hands after the stop at Angeles Bay. The bay was found to be very shallow, and has a long stretch of sand beach back of which are many rough ridges of lava and dry washes with dense mesquite thickets along the edges. A Mexican rancher, met here, informed us that mountain sheep were abundant in the interior, and showed several heads that he had hanging about an old corral.

Sal si Puedes, a small barren island about a mile long, was visited on May 9. No anchorage was found here, the vessel lying off a very dangerous coast owing to the many sunken rocks and many others just awash. A colony of brown pelicans and a small colony of Heermann's gulls were found breeding. At noon, departure was taken for South San Lor-

enzo Island, and a couple of hours later, a landing was made on a long boulder beach on the west side. The island is about 12 miles long, steep and rugged, and the largest of the islands forming the east side of the Sal si Puedes Channel. Deep water is encountered close up to the beach, and good holding ground could not be found even with a kedge. The small cañons opening on the beach were visited, the hillsides being very steep and rocky, and without vegetation except now and then a cactus. Late in the afternoon, the run to San Francisquito Bay was made to anchor for the night.

San Francisquito Bay proved to be an excellent anchorage, the *Silver Gate* going into the little cove at the south end of the bay to anchor. Like most of the bays along the coast, the surrounding country was dry and barren. This country, however, contained an unusual amount of bird life. Quail were very abundant, and the large number of small birds was very noticeable. Among them were verdins, cactus wrens, thrashers, hummingbirds and flycatchers. A few coyotes, and a great number of jackrabbits were seen.

Tortuga, visited on May 11, is the only one of all the islands having a well-formed crater which is some 200 feet deep and about a half a mile across. The island is a little over 1000 feet in height, quite rugged, and cut up by many fresh lava flows. It is famous about the Gulf for the large number of rattlesnakes on it. The expedition secured 17 in a day and a half, and a few others were seen but not captured. Four specimens were taken from a pile of débris, formed by the breaking down of an old osprey nest in a giant cactus. The waters about the island abounded in whales and they were continually passing the *Silver Gate* while she was at anchor, some coming as close as 20 or 30 yards. The anchorage being poor, and subject to strong shifts of wind whirling around the island, it was necessary to run to San Marcos Island to anchor for the night.

San Marcos is a low barren island a little over five miles long, and is the site of a small tannery used to cure the hides of the cattle killed at Santa Rosalia. Water can be obtained by sinking wells, and at the south end, there are some probably permanent pools of water in the small cañons where there

are a few groves of palms. In this vicinity, there are also extensive gypsum beds.

On May 13, departure was taken for Mulegé via South Santa Inez Island, a barren low island, less than a mile long, and only about 30 feet above high water. Several old graves were seen on top of the island, and, along the shores were the remains of old camps used by the pearl fishermen. The island is most desolate and uninteresting.

Mulegé, a picturesque little village situated about a mile inland on the banks of the Rio Santa Rosalia and formerly the site of the Mission of Santa Rosalia de Mulegé, was reached early in the afternoon, the *Silver Gate* anchoring off the bar to await high water. The Captain of the Port came aboard and informed us that he had a direct wire from Mexico City to tender the expedition the courtesies of the port. The expedition was received here as well as at all other ports of entry with the utmost courtesy by the Mexican officials. A visit was paid to the old mission church, situated on a hill back of the town and commanding a magnificent view of the river and valley with its groves of palms and banana trees. The merchants of Mulegé are mostly Chinese and appear to be quite prosperous. Opportunity was taken here to get some necessary supplies and late in the afternoon of the 15th of May, the *Silver Gate* crossed the bar and anchored outside for the night.

At daybreak, the vessel was under way again bound for Ildefonso Island, but, on account of the heavy head wind and sea, put into San Nicolas Bay and anchored under the lee of Pt. Santa Antonita, a low rocky bluff some 15 feet high forming the southern point. A landing was made here, and about a mile back of the beach some of the most productive fossil beds encountered on the expedition were found. The low lands back of the beach extend well into the interior, and are covered with a heavy growth of cactus and mesquite. Land birds were fairly plentiful; verdins, cactus wrens, quail and gnatcatchers. The heavy winds continued well into the night, but calmed down towards daybreak when the run to Ildefonso Island was made. It was found to be a barren rocky island a little more than a mile in length and nearly 400 feet in height. On the west side was found quite a large

pelican colony and a small colony of Heermann's gulls. Many frigate birds were flying about the north end, but no nesting sites were found. The vessel found anchorage with a kedge in 15 fathoms on the east side of the island, but the wind hauling to the southeast and kicking up a rough sea, the *Silver Gate* ran to the north end and took off the landing party, then making a rough passage across the channel, anchored again under the lee of Pt. Santa Antonita.

Coronados, a rough volcanic island nearly two miles in length and about a mile and a half wide, was reached on the morning of May 18, and excellent protection from the southeast wind found under the lee of the long sandspit extending from the southwest end of the island. Although a small island, birds were very plentiful; flycatchers, hummingbirds, house finches, duck hawks, ravens and buzzards being noted. Nine species of reptiles were found on it. Owing to the excellent protection it affords from both northerly and southerly winds, Coronados is frequently visited by vessels sailing in the Gulf.

On the morning of May 19, the expedition arrived at the town of Loreto, the first capital and the site of the Mission of Loreto, the first in either of the Californias. It was founded by Padre Juan Maria Salvatierra, on October 25, 1679. Loreto is most intimately connected with the history of California, as it was the headquarters of all the missions, and it was from here that the Franciscan Padre Serra traversed the peninsula in a northwesterly direction, till he crossed the 32nd parallel, and on the feast of St. James, 1769, founded the Mission of San Diego, the first in Upper California. In the autumn of 1717, the town was destroyed by a great storm, but was rebuilt and always remained one of the principal towns in Lower California. The present stone church is in a fair state of preservation and dates from 1793. It is still in use, and at present in care of Padre José Negreta who is endeavoring to restore it. It had by far the most elaborate interior of any of the Missions of either Upper or Lower California, and still contains many of the old paintings and statues. Around the patio are the walls of the old college which are in an excellent state of preservation. Loreto exports much of the bark of the Palo Blanco used in the tannery at La Paz.

On the afternoon of May 20, the expedition proceeded to the west coast of Carmen Island and made the first stop at Puerto Ballandra, a little harbor on the northwest coast. It was found to be an excellent anchorage, the entrance between headlands being only a few hundred yards wide. It is frequently used by small boats from Loreto, which run over to take shelter in bad weather. Several species of reptiles were particularly abundant in this vicinity, and also many small birds were noticed, notably cardinals and verdins. This locality is probably the best collecting ground on the island. May 23 was spent at Marquer Bay on the southwest coast where some rich fossil beds were found. The southern end of the island was found to be very dry and barren and cut up by innumerable small gullies. Having to anchor close to the beach on a lee shore, it was necessary to cross to the peninsula and make anchorage for the night at Puerto Escondido.

Puerto Escondido, or hidden port, is a landlocked harbor offering perfect shelter from all winds, the entrance being about 70 feet wide. An excellent view of the Sierra Gigantas is had from the bay and many deep cañons with groves of palms are plainly visible. A flat some three miles long, and covered with a heavy growth of cactus and mesquite extends from the shore line to the foot of the Sierras.

Danzante Island was visited next morning, May 24. It is a small rugged island about three and a half miles long with precipitous sides, so it is only possible to land at the mouths of one or two little cañons that reach to the seacoast. All of the promising looking spots were gone over in a few hours, and departure was taken for Monserrate Island which was reached at 2 P. M. of the same day.

Monserrate Island is about four miles long and a little over 700 feet in height. Anchorage was made off the north end opposite a small sand beach. The island, at this point, was found to be extremely barren and cut up by small dry washes with walls of lava on each side. Reptiles and birds were fairly plentiful. Among the latter, verdins, flycatchers, and gnatcatchers were quite common. At noon we moved around to the south end of the island and found collecting very much worse. Some pearl oyster shells were taken by diving from the skiff close in to the beach.

The wind, shifting early in the afternoon, put the vessel on a lee shore which necessitated moving over to Agua Verde Bay on the peninsula. The anchorage was reached late in the afternoon and, on entering the bay, the vessel passed close to Solitaria Rock, a large pinnacle 115 feet high with an osprey's nest on the tip of it. There is a small cattle ranch at the south end of the bay where freshwater and wood may be obtained. Advantage was taken of this, and the vessel watered and a load of wood taken on for the galley. Back of the beach is much level country covered with a heavy growth of mesquite and cactus. Among the numerous cactus thickets doves, quail, and jackrabbits were very abundant and extremely tame.

Having taken on all the wood and water possible, the vessel proceeded to Santa Cruz Island and a landing was made on the morning of May 27. Santa Cruz Island is a steep granite ridge about 1500 feet high and four miles long. It is possible in fine weather to land at one or two places on the west side. At the southwest end there is a small beach with a sunken ridge extending towards the southwest on which anchorage may be made with a kedge, providing the wind is light. Two of the largest cañons were visited from this landing. They proved to be very barren and practically without bird life. The usual giant cacti were present, and an abundance of lizards (*Sator angustus*). At noon, a strong southeast wind coming up, the vessel was no longer able to hold on with the kedge, so the landing party was called off, and the vessel proceeded to San Diego Island where good protection is found from the southeast winds. San Diego was found to be about the same as Santa Cruz only a little smaller and not quite so rugged. It is about a mile in length and a little over 700 feet in height.

On May 28, Salinas Bay, on the west coast of San José Island, was visited. The vicinity of the anchorage presented a series of low hills densely covered with brush. On going ashore the country was found to be just as it appeared and burro trails had to be followed in places in order to make any progress through the brush. Many deer signs were seen as well as one or two animals. A great many land birds were seen here; cardinals, doves, and hummingbirds were abun-

dant, and woodpeckers particularly so. A stop at Amortajada Bay occupied another day and on May 30, San Francisco Island was visited.

San Francisco Island, although a small one, contains quite a large fauna. Ravens, vultures and frigate birds were abundant and a few small land birds were seen. In the low bushes skirting the back of the sand beach were many woodrat nests. Three or four species of lizards were also found.

On May 30, Espiritu Santo Island, which forms the east shore of La Paz Bay, was reached, and anchorage made at Isla Partida, the northern portion of the island which is separated from Espiritu Santo proper by a narrow boat channel. The island from the sea presents the appearance of a large tableland with many small peaks scattered about it. It is strictly volcanic and very rough. The anchorage at Isla Partida is well sheltered, but very shallow, making it necessary to anchor two or three hundred yards off the sand beach. Back of this beach, a deep cañon extends towards the interior. A well has been sunk at the mouth of it, where fishermen obtain water of a somewhat doubtful quality. Domestic goats run wild over the island. San Gabriel Bay, on Espiritu Santo proper, was once the site of a station for raising pearl oysters, but the settlement was unfortunately destroyed during the revolution and no attempt was ever made to rebuild it.

On June 2, the *Silver Gate* dropped anchor off La Paz, the principal port of the Peninsula of Lower California, and capital of the southern district. Next day, the vessel loaded supplies and fuel which had been in storage awaiting the arrival of the expedition. La Paz is a typical Mexican town of some 4000 inhabitants. Its principal exports are hides, fruits, and pearls. It has long been famous as one of the greatest ports in the world for its pearl fisheries.

On the evening of June 5, all supplies and fuel being on board, the *Silver Gate* moved down the coast and anchored opposite Ceralbo Island. The run across the San Lorenzo Channel was made at daybreak, and on the morning of June 6 anchorage was made off Gordas Point, the southernmost locality visited by the expedition.

Ceralbo is a high, barren, mountain ridge some 15 miles in length covered with a dense growth of brush and cactus. It

reaches a height of nearly 2500 feet. Señor Antonio Ruffo has a small cattle ranch on the island, but, on account of the lack of suitable feed, the animals fare poorly. Freshwater is obtained from wells at the ranchhouse about four miles north of Gordas Point. About two and a half days were spent working along the west coast, and, at noon on June 8, the start northward was made.

According to a previously arranged schedule, all the islands possible were to be visited on the way south, and on the northern trip, the most profitable collecting grounds were to be worked together with such new ones as time would permit. Santa Catalina was the only island missed on the run south, and this one on account of shortage of fuel. After having bucked head winds continuously since leaving Guaymas, it was deemed advisable to conserve fuel and visit the island on the run north. This was done on June 12, when the *Silver Gate* anchored off the southwest end.

Santa Catalina being well off shore, and out of the track of vessels, is probably seldom visited. The island is about seven miles long and 1500 feet in height, very rough, and covered with a dense growth of brush and cactus. In the small valley opposite the anchorage, land shells were found in greater abundance than at any other place visited by the expedition. Land birds were also fairly abundant. The wind, hauling to the westward early in the afternoon, put the vessel on a lee shore, so a run was made to Monserrate Island where better anchorage could be found.

June 14 found the *Silver Gate* again at anchor in the little harbor of Puerto Escondido. Two members of the expedition made a trip into the Sierra Gigantas, exploring a large cañon visible from the anchorage and reported finding plenty of excellent freshwater and several large groves of palm trees.

On the morning of the 15th, the expedition was again under way and, after a short stop at Danzante, the *Silver Gate* rounded the southern end of Carmen Island and, cruising up the east coast, anchored at Agua Grande, five miles south of Salinas Bay. About half a mile up the cañon from the anchorage is an excellent spring of freshwater. A small reservoir has been constructed to hold the water which is piped to the coast. It is taken by boat to the settlement at

Salinas Bay, as freshwater cannot be obtained there. In the evening the *Silver Gate* shifted her berth and anchored off the settlement.

Carmen Island is probably the best known of all the islands in the Gulf on account of its extensive salt deposits. An immense lake of remarkably pure salt extends over a mile inland and is entirely shut off from the waters of the Gulf. These salt beds have been known and worked for years. As far back as 1717, Father Juan Maria Salvatierra petitioned the King of Spain for permission to work the salt beds, saying: "There is enough salt to supply the whole world." At the present date, the concession is in the hands of an English company.

On the morning of June 17, the expedition arrived at Guadalupe Point, Concepcion Bay. Collecting being poor, a run down the east side of the bay was made. Early in the afternoon, the wind and sea became so strong it was necessary to run under the lee of San Ignacio and drop anchor. All hands remained on board. Next morning, the vessel made a run across to the west side and dropped anchor in Coyote Bay. Owing to lack of time only short stops were now being made and departure was taken early in the morning for San Marcos Island which was visited for the second time.

On the afternoon of June 20, the expedition arrived at Santa Rosalia, the capital of the northern district of Lower California, and the site of one of the world's largest copper mines. The port shows the work of foreign capital and a fine breakwater made of slag from the smelter has been constructed, giving excellent shelter from the storms that sometimes sweep the Gulf. The members of the expedition were entertained by the Mexican and French officials, and were taken on a tour of the mines. There are now over 80 miles of tunnels some of which run 33 feet below sea level. The port regulations, prohibiting vessels leaving between sunset and sunrise, were very kindly waived by the officials in order to facilitate the movements of the expedition, and, at 4 A. M. on June 22, the *Silver Gate* weighed anchor and proceeded to Tortuga Island where a second stop of one day was made.

Continuing northward, stops were made at San Francisquito Bay on June 23, North and South San Lorenzo Islands

on June 24, and Isla Partida on June 25. The eggs of the least petrel were again collected and found in all stages of incubation.

Angeles Bay was visited for the second time on June 25 and a stop of two days was made. During this stop, all hands watered ship, and, on the morning of June 28, the *Silver Gate* headed up Ballenas Channel, cruising along the west coast of Angel de la Guardia Island. It was the intention to make a landing at Humbug Bay, but a heavy wind and sea sweeping down the channel prevented this, so the course was set for Puerto Refugio, which was reached shortly after noon.

On the morning of June 30, a cruise along the east side of Angel de la Guardia was made, but again heavy winds prevented a landing, and about noon the vessel anchored under the lee of Pond Island at the southern end of Angel de la Guardia. The southeast end of Angel de la Guardia was visited from this anchorage, and an effort made to discover any signs of the supposed ancient ruins said to be on the island. Not the least signs of any were found. From some of the higher elevations, several large valleys extending some miles inland, and cut up by the characteristic dry washes of the desert, were seen. Considerably more vegetation was found here than at the northern end.

At 4 A. M. on July 2, departure was taken for Tiburon Island, but on account of the heavy southeast wind and sea, the vessel ran under the lee of Isla Partida and came to anchor. All hands remained on board waiting for the weather to moderate. The wind and sea going down somewhat early in the afternoon, the run to Tiburon was continued, and after a rough passage, anchorage was made off the southwest end of the island about three miles north of Willard's Point. A landing party went ashore early next morning working towards the interior. Many deer trails and beds under the mesquite trees were seen and also several animals. The large antelope jack rabbit was quite common. Signs of old Indian camps were seen but no Indians were met at this end of the island. Next morning the vessel moved around to the southeast end. The country was found to be very similar to that just left and plenty of deer signs were found. The animals

are probably quite abundant, although hunted by the Seri Indians, some of whom now possess firearms.

In the afternoon of July 5, the run to Pelican Island, a small island three miles off Kino Point on the coast of Sonora, was made. As the vessel approached the island, hundreds of frigate birds were seen hovering over it, and the sand spit extending from the west end, was literally covered with pelicans. The island is practically destitute of vegetation and is nothing more than a bird rookery. The heavy swell running made the anchorage poor, so the vessel's berth was shifted and anchorage made under the lee of Kino Point.

At 4 A. M. on July 6, anchor was weighed, and a course set for Ensenada Grande, 60 miles to the southward, which, on account of a heavy head wind and sea, was not reached till 4 P. M. As the *Silver Gate* rounded the northern point of the bay, several groves of palms as well as many single trees were seen scattered about the high bluffs. A day's stop was made here, and the *Silver Gate* was again headed south and a course set for San Carlos Bay, a two hours' run.

San Carlos is a small landlocked harbor about 10 miles to the westward of Guaymas, and affords excellent anchorage as it is protected from all winds. Two days were spent here, packing up the various collections for shipment and preparing for the return to Guaymas. At 6 A. M. on July 10, the expedition left San Carlos Bay, arriving at Guaymas at 10:15 A. M., after spending 87 days in the field and making a cruise of 1811 miles.

LOCALITIES VISITED

Coast of Sonora

Guaymas	April 13-16	July 10-11-12-13
San Carlos Bay.....	April 16	June 7-8-9-10
San Pedro Bay (Ensenada Grande) ..	July 6-7	
Kino Point.....	July 5	
Tepoca Bay.....	April 25	

Peninsula of Lower California

San Luis Gonzales Bay.....	April 28-29	
Angeles Bay.....	May 4-5-6-7	June 26-27
Las Animas Bay.....	May 7-8	
San Francisquito Bay.....	May 9-10	June 23
Santa Teresa Bay.....	May 10	
Santa Rosalia.....	June 20-21	
Mulegé	May 13-14-15	
Guadalupe Point (Concepcion Bay) ..	June 17	
Coyote Bay " " ..	June 18	
Point Santa Antonita (San Nicolas Bay)	May 16-17	
Loreto	May 19-20	
Puerto Escondido.....	May 23	June 13-14
Agua Verde Bay.....	May 25-26	
San Evaristo.....	June 10	
La Paz.....	June 2-3-4-5	

Islands in the Gulf of California

San Pedro Nolasco.....	April 17	
San Pedro Martir.....	April 18	
San Esteban.....	April 19-20	
Tiburón		
Freshwater Bay.....	April 23	
Willard's Point.....	July 3	
Monument Point.....	July 4	
2 miles north of Monument Point..	July 5	
Patos	April 23-24	
Georges	April 26-27	
San Luis.....	April 28	
Mejia	April 30	June 28
Granite	May 2	
Angel de la Guardia		
Puerto Refugio.....	April 30	May 1 June 28-29
Lagoon E. central coast.....	May 2	
Palm Cañon.....	May 3	
Pond Island Bay.....	June 30	July 1
Smiths	June 27	
Isla Partida.....	April 21-22	May 3 June 24-25
Isla Raza.....	April 21	May 4

Sal si Puedes.....	May 9	
North San Lorenzo.....	June 24	
South San Lorenzo.....	May 9	June 4
Tortuga	May 11	June 22
San Marcos		
Vicinity of Tannery.....	May 12	June 20
Southwest point.....	June 19	
South Santa Inez.....	May 13	
Ildefonso	May 17	
Coronados	May 18	
Carmen		
Puerto Bellandra.....	May 20-21-22	
Marquer Bay.....	May 23	
Agua Grande.....	June 15	
Salinas Bay.....	June 15-16	
Danzante	May 24	June 15
Monserrate		
North end.....	May 25	June 13
South end.....	May 25	
Santa Catalina.....	June 12	
Santa Cruz.....	May 27	June 11
San Diego.....	May 27	June 11
San José (San Josef)		
Vicinity of Salt Beds.....	May 27	June 10
Amortajada Bay.....	May 28-29	
San Francisco.....	May 30	
Isla Partida (Espiritu Santo).....	May 30-31	
Espiritu Santo		
El Candelero.....	June 8-9	
San Gabriel Bay.....	June 1	
Ceralbo		
Gordas Point.....	June 6-7	
Ruffo Ranch.....	June 7	
El Mostrador.....	June 8	
Las Galleras (East and West).....	June 13	
Ballena	June 9	
Pond	July 1	
Pelican	July 5	

72'



Boundary between Mexico and the United States

Los Coronados Is.

COLORADO RIVER

C. Sn. Quintin

30°

30'

29°

30'

28°

30'

Conseg Rock

Georges I.

Tepoca Bay

San Luis I.

San Luis Gonzales Bay

Mojia I. Grande I.

Angel de la Guardia I.

Potos I.

Smiths I.

Pond I.

Angoles Bay

Los Animas Bay

Isle Partida

Salis Puques I.

San Francisco Bay

Santa Teresa Bay

Tiburon I.

Relian I.

Kino Pt.

San Esteban I.

San Pedro Martir

San Pedro Bay

San Pedro Nolasco I.

San Carlos Bay

CHUANMAS

Portuga I.

LOWER

SANTA

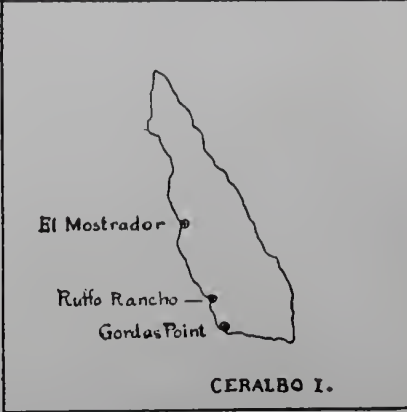
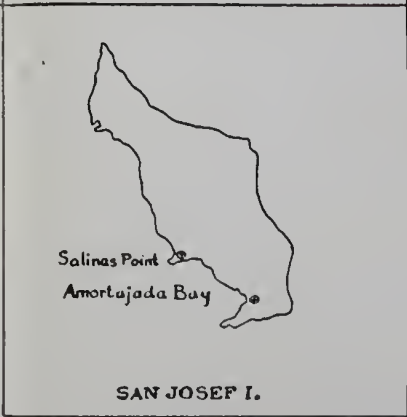
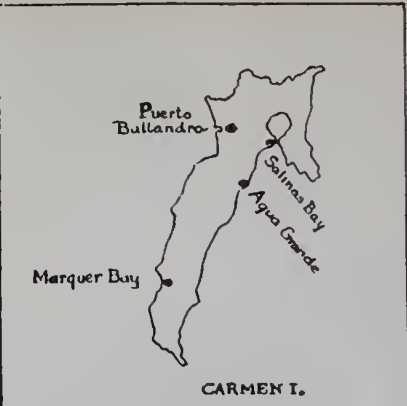
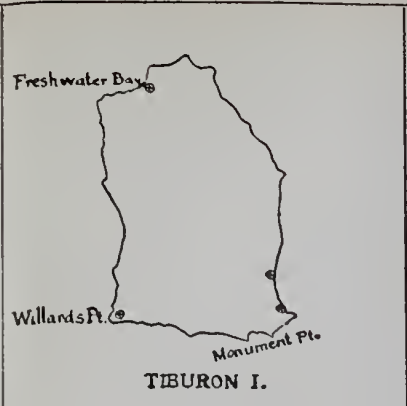
San Benito Is.

Cedros I.

SEBASTIAN VISCAINO BAY

BAY

Pt. Sn. Eugenio



SONORA



GULF OF CALIFORNIA

SHOWING ROUTE OF CALIFORNIA
ACADEMY OF SCIENCES 1921
EXPEDITION

Based on Charts No. 620, 621, 1006
U.S. Hydrographic Office

Drawn by G. Dallas Hanna



PROCEEDINGS
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VII

EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹

THE BEES (I)

BY

T. D. A. COCKERELL
University of Colorado

The bees recorded below were collected by Mr. E. P. Van Duzee, and are remarkable for their excellent condition and scientific interest. The types are in the California Academy of Sciences where they may be compared with those of Fox from the same region.

ANTHOPHORIDÆ

Mr. Wm. J. Fox published three reports on the bees of Lower California and adjacent regions (Proc. Cal. Acad. Sci., Ser. 2, Vols. IV (1893-1894) and V (1895)). The Anthophoridæ there recorded are:

Melissodes suffusa Cresson. San José del Cabo, Mesa Verde.

Melissodes 4 spp. indet. Some doubtfully referred to *M. menuacha* Cresson.

**Diadasia diminuta* Cresson (*apacha* Cresson). San Julio, San Esteban, San José de Gracias.

Diadasia enavata Cresson. Comondu.

Anthophora maculifrons Cresson. San José del Cabo.

Anthophora sp. (aff. *urbana*). San Esteban.

Anthophora sp. (aff. *exigua*). San José del Cabo.

¹ A map showing the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be had at nominal cost.

- Anthophora capistrata* Cresson. El Taste.
Centris lanosa Cresson. San José del Cabo, Calmalli Mines, Calamujuet.
 Also Herinosillo, Sonora, Mexico.
Centris n. sp. San José del Cabo.
 **Centris eisenii* Fox. Guaymas.
Xenoglossa mustelina (Fox). Described as *Centris*. San José del Cabo.
 Later erroneously referred to *X. fulva* Smith.
 **Exomalopsis pulchella* Cresson. San José del Cabo.
Ancylosceles toluca (Cresson). San José del Cabo.

The material examined by Mr. Fox was partly in bad condition, rendering some of the determinations difficult or uncertain. The species marked with an asterisk are also in the present collection.

Including all the species, we have 11 which are identical with those of the Southwestern United States, 5 subspecies of species of Southwestern States, 10 distinct species allied to those of S. W. States, 5 species (*Exomalopsis*, *Ancylosceles*, *Centris eisenii*) of tropical affinities, and two isolated species with no close relatives known.

Intensive collecting in this region will undoubtedly yield results of great scientific interest. Some of the questions to be answered are:

- (1.) What is the relation of the bees to the peculiar flora of the gulf region? Probably many are oligotropic, more or less restricted to particular genera or species. To what extent are their peculiarities adaptive?
- (2.) There is evidence that factor-mutations occur, giving rise to distinct races, differing in eye-color, etc. Do such mutations occur at random? And how do they become established as racial or specific characters?
- (3.) What evidence is there of particular trends of variation, in response to climatic conditions?
- (4.) Are there any precinctive species or varieties on the different islands? The records suggest an affirmative answer, but more collecting may show that all the insular forms also occur on the main land.
- (5.) What are the natural enemies of these bees?
- (6.) The nesting habits and larvæ are unknown.

CENTRIS Fabricius

1. *Centris eisenii* Fox

Guaymas, April 11.

2. *Centris rhodopus* (Cockerell)

Guaymas, April 11, ♂ ♀; Tiburon Island, April 23, ♂; Angeles Bay, May 7, ♂, June 27, ♂, June 26, ♀; Tortuga Island, May 11, ♀; Escondido Bay, May 24, ♀; San Carlos Bay, July 8, ♀.

3. *Centris atripes* Mocsary

Guaymas, April 11. ♂; I have expressed the opinion that *C. fovi* Friese is a synonym, but it differs in the color of the flagellum ("testaceous beneath from apex of first joint"), and is probably a valid species, or at least a distinct race.

4. *Centris vanduzeei* Cockerell, new species

Female (type): Length about 13.5 mm., anterior wing 10.4 mm.; robust, black, including face, mandibles and antennæ; mandibles quadridentate, the two inner teeth much smaller than the others, and on a different plane; eyes brown; face and front polished and shining, the clypeus polished and impunctate in middle; front rather broad, but distance from anterior ocellus to apex of clypeus greater than width of front; labrum with brownish hair; cheeks, occiput and region of antennæ with white hairs, vertex with pale fulvous; third antennal joint very long, about as long as the next five together; thorax densely hairy, the hair pale fulvous above, otherwise white, pale reddish in middle of sternal region; tegulæ subpiceous; wings dusky hyaline, nervures fuscous; legs black, with pale hairs, long and white on anterior femora beneath; anterior tarsi with dense reddish (almost coppery) hair, and long pale reddish hairs posteriorly; apical part of middle tibiæ and whole of basitarsi with red hairs; hind tibiæ and basitarsi with a large light red scopa, the basitarsi very broadly and squarely truncate at apex, with a very long and even comb; small joints of tarsi red; abdomen thinly covered with erect white hairs, not hiding the surface, but with distinct white hair-bands on apices of segments; apex with bright orange-fulvous hair.

Male: Length about 15 mm.; clypeus, mandibles and antennæ black as in female; eyes reddish, very large, strongly converging above; wings clearer; hind femora very robust, covered with dull white hair, their tibiæ and tarsi relatively slender; hind spurs bright ferruginous, the inner curved and much longer than the outer; hind basitarsi obliquely truncate at end, with a comb; posterior half of tegulæ pale. The only male is denuded of pubescence.

San José Island (type locality), May 28, 1921 (E. P. Van Duzee), 1 ♀, 1 ♂. Also 3 females from Monserrate Island, May 25 (Van Duzee). All the females have collected extremely bright orange pollen on their hind legs, possibly from one of the Solanaceae.

A very distinct species, somewhat like *C. hoffmannseggiae* Kll., but easily separated by the black face in both sexes, and other characters.

Type: Female, No. 931, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 28, 1921, on San José Island, Gulf of California.

5. *Centris rhodoleuca* Cockerell, new species

Male: Length about 14 mm.; anterior wing 11.2 mm.; head and thorax black, the clypeus, labrum, greater part of mandibles, scape in front, and a line along anterior orbits from level of antennae down (broadening below) all very bright yellow; legs ferruginous; abdomen with first two segments and base of third suffusedly ferruginous, the rest black, except that hind margins of segments are broadly pallid; head and thorax with abundant shaggy white hair, but clypeus nude; legs with some white hair, long and abundant on hind legs; abdomen with abundant, erect white hair, except on second segment which is only hairy apically; mandibles slender, quadridentate, the apical teeth long and slender, the others short and triangular, the third much larger than second or fourth; eyes ferruginous; scape above and third antennal joint ferruginous, third joint short, hardly so long as next two together; orbits parallel; front rather broad, but not as broad as distance from anterior ocellus to lower margin of clypeus; tegulae reddish testaceous, darkened basally; wings hyaline, nervures dark fuscous; basal nervure falling far short of transverse median; spurs red.

A beautiful and interesting species, related to *C. morsei* Kll., but with narrower face, red legs and other differences.

Type: Male, No. 932, Mus. Calif. Acad. Sci., collected by F. P. Van Duzee, July 3, 1921, at Willard's Point Bay, Tiburon Island, Gulf of California.

6. *Centris cockerelli resoluta* Cockerell, new subspecies

Female: (Type) Similar to *cockerelli* Fox from New Mexico, but clypeus and labrum apricot-color or reddish orange instead of pale yellow; hind knee plate with a bright red mark; under side of thorax with brownish gray hairs (it is not entirely pale in typical *cockerelli*); eyes dark brown.

Male: Resembles *C. atripes* Mocs. (the male of *cockerelli* is not known), but the front is narrower, the eyes more prominent above, a strong depression or channel laterad of lateral ocelli, and space between eyes and orbits entirely black.

In the tables of Fox the female runs nearest to *cockerelli* and the male (which has entirely pale hair on the thorax beneath) to *lanosa* Cresson. The eyes are quite differently colored from those of *lanosa*. The clypeus in one La Paz male is clear yellow, in the other reddened, apparently by cyanide.

Type: Female, No. 933, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 3, 1921, at **La Paz, Lower California**. Another female obtained by Mr. Van Duzee May 5, 1921, at Angeles Bay.

7. *Centris cockerelli* Fox, variety B

Female: Similar to the La Paz form, but eyes (in dead specimens) pale greenish gray instead of brown. Hair of thorax grayish-brown beneath.

This is intermediate between the *cockerelli* of New Mexico and the *resoluta* form, and is the form of *cockerelli* which Dr. Davidson took in southern California.

Generally speaking, differences in eye-color in the same sex in anthophorid bees are indicative of distinct species; but in one case at least (*Anthophora porterae thalassina* Ckll. 1920), the difference can only be regarded as varietal. Unfortunately the dried specimens do not show the colors so clearly as the fresh insects. In *Centris* species seem to be modified by a series of factorial mutations, as in *Drosophila*, and it requires biological observations in difficult cases to determine whether the segregates are behaving as distinct species, or are still capable of inbreeding, with Mendelian results. It is quite possible that such segregates, when isolated, may remain constant and have the aspect of distinct species, but may freely cross when the ranges of two overlap. Thus it might be necessary to collect a form in all parts of its range in order to determine its exact status.

Two specimen collected by E. P. Van Duzee, April 11, 1921, at Guaymas.

8. *Centris pallida callognatha* Cockerell, new subspecies

Female: Looks exactly like *C. pallida* Fox from Arizona, except that the hair on thorax above is redder; the clypeus, however, has only a minute pyriform yellow mark, the face is rather broader, the mandibles have a larger bright red patch externally just before the apex, the eyes appear to have been sea-green in life, and the pygidial plate is conspicuously broader.

Type: Female, No. 934, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 11, 1921, at **Guaymas, Sonora, Mexico.**

9. *Centris tiburonensis* Cockerell, new species

Female: Length about 14 mm., anterior wing 9 mm.; very close to *pallida* Fox, of which it at first sight appears to be a small example, but the wings are unusually short, the clypeus is entirely black, the abdomen is without the distinct yellowish tint on basal half, and the fifth segment, instead of having a broad apical dark band, is suffusedly blackened over the greater part, leaving the laterobasal areas pallid. The mandibles have no red subapical patch; the antennæ are entirely black. In *C. pallida callognatha* there is a rather distinct band of fulvous hair across the front, below the ocelli; this is wanting in *tiburonensis*, which has the hair of the front white, but that of the vertex pale fulvous-tinted.

Type: Female, No. 935, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 23, 1921, at **Freshwater Bay, Tiburon Island, Gulf of California.**

10. *Centris trichosoma* Cockerell, new species

Male: Length about 14 mm., but appearing less bulky than *C. rhodoleuca*; black, including antennæ and legs (tarsi dusky reddish apically); clypeus bright yellow; labrum yellow, densely covered with white hair; mandibles with a large yellow area on either side; insect densely covered with white pubescence, on thorax above pale yellowish. Eyes reddish brown or greenish, strongly converging above, the front narrow; mandibles tridentate; third antennal joint long and slender; hind tibiae and basitarsi with long white hairs. Very close to *C. hoffmannseggiae* Ckll., and possibly to be considered a race of that species, but easily distinguished by the bright lemon-yellow clypeus, the color of the eyes and the upper border of the mandibles black. The Californian form, *C. hoffmannseggiae davidsoni* Ckll., equally differs in the clypeus and mandibles; its mandibles are black with a broad cream-colored stripe along upper border.

Type: Male, No. 936, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee at **Angeles Bay, Lower California.** Another

male was taken at Freshwater Bay, Tiburon Island, April 23, 1921.

The above species of *Centris* may be separated as follows:

Abdomen with broad yellow tegumentary bands.....	<i>eiseni</i> Fox.	
Abdomen without yellow bands.....		1
1. Clypeus black (or with a minute yellow spot).....		2
Clypeus yellow or red.....		5
2. Hind tibiae (except base) and tarsi with black hair.....		3
Hind tibiae and tarsi with hair not black.....		4
3. Larger, mandibles with a bright red patch below apex.....		
..... <i>pallida callognotha</i> Ckll. ♀		
Smaller, mandibles with no such red patch.....	<i>tiburonensis</i> Ckll. ♀	
4. Eyes converging above, orbits close to lateral ocelli.....		
..... <i>vanduzeei</i> Ckll. ♂		
Eyes not converging above, orbits not close to lateral ocelli.....	<i>vanduzeei</i> Ckll. ♀	
5. Abdomen covered with gray or whitish pile; clypeus yellow....		6
Abdomen nearly or quite bare of pale hair, except basally, so		
appearing black.....		7
6. Front broad, legs red.....	<i>rhodoleuca</i> Ckll. ♂	
Front narrow, legs black.....	<i>trichosoma</i> Ckll. ♂	
7. Femora entirely red, clypeus red.....	<i>rhodopus</i> Ckll. ♀	
Femora partly or wholly dark, or clypeus yellow or orange....		8
8. Hind tibiae with pale hair on outer side; scape with a yellow		
mark; legs largely red.....	<i>rhodopus</i> Ckll. ♂	
Hind tibiae with black or very dark hair on outer side.....		9
9. Clypeus reddish; third antennal joint long.....		10
Clypeus yellow, third antennal joint shorter.....		11
10. Eyes brown.....	<i>cockerelli resoluta</i> Ckll. ♀	
Eyes greenish gray.....	<i>cockerelli</i> Fox, var. <i>B.</i> ♀	
11. A yellow mark between clypeus and eye; front broader.....		
..... <i>atripes</i> Mocs. ♂		
No yellow mark between clypeus and eye; front narrower.....	<i>cockerelli resoluta</i> Ckll. ♂	

ANTHOPHORA Latreille

All the species collected belong to the subgenus *Micranthophora* Ckll.

11. *Anthophora curta* Provancher

San Francisquito Bay, May 10, 5 ♀, 2 ♂; La Paz, June 3-5, 4 ♀, 1 ♂; Mulegé, May 14, 1 ♀; Palm Cañon, Angel de la Guardia Island, May 3, 1 ♀; San Nicolas Bay, May 16, 1 ♀, 1 ♂; Guaymas, April 11, 1 ♂.

12. *Anthophora phenax* Cockerell

Loreto, May 20, 1 ♂. Described from New Mexico.

13. *Anthophora leucostomella* Cockerell, new species

Male: Length about 10 mm.; black, with clypeus, transverse sub-clypeal band (widening in middle), lateral face-marks (filling space between clypeus and eye, and broadly emarginate or excavated above), labrum (except basal spots and narrow apical margin), large patch on base of mandibles, and scape in front, all white. Abdomen with thin but entire marginal hair-bands, the margins beneath the bands hyaline. Very like *A. phenax*, for which I at first took it, but differing thus: face-marks, although white, with a faint creamy tint; lateral face-marks with upward extension along orbits longer and narrowly pointed; hair of head and thorax above white, without any black; hair on inner side of hind tarsi pale fulvous; the two apical teeth of abdomen small but prominent, pale fulvous with dark tips. The eyes in the dried specimen are pale gray.

Type: Male, No. 937, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 1, 1921, at Puerto Refugio, Angel de la Guardia Island, Gulf of California.

14. *Anthophora pachyodonta* Cockerell, new species

Male: Length about 10 mm.; black, with broad band on lower part of clypeus, labrum (except two spots, and narrow apical border), and mandibles (except rufous apex) yellow, or rather orange in the type, perhaps altered by cyanide; eyes deep reddish-ferruginous, perhaps affected by cyanide; antennæ entirely black, last joint somewhat broadened, flattened, and broadly truncate; hair of head and thorax abundant, pure white, with no admixture of black hairs; femora with long white hair beneath; tibiæ and tarsi densely clothed with creamy-tinted pubescence, orange-ferruginous on inner side of tarsi, and with a good deal of same color on inner side of hind tibiæ; tegulæ testaceous; wings hyaline, nervures piceous; abdomen densely covered with short creamy-tinted hair; hind margins of apical segments broadly pellucid; apical teeth two, very broad, rounded at end, pale fulvous.

Intermediate between *A. maculifrons* Cresson and *A. flavocincta* Huard. The dark tarsi (small joints obscurely reddish), black flagellum, etc. readily separate it from *flavocincta*. The apical teeth of abdomen are smaller and less divergent than in *flavocincta*.

Type: Male, No. 938, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 16, 1921, at San Nicolas Bay, Lower California.

15. *Anthophora xanthochlora* Cockerell, new species

Female: Length about 10 mm.; black, with a very broad band covering lower half of clypeus, and sending a broad median band to upper margin, narrow transverse supra clypeal band, labrum (except two small

spots and narrow lower margin), and mandibles (except apex), all bright chrome-yellow; eyes bright yellowish green; scape black, with two small yellow spots; flagellum short, very obscurely reddish beneath, truncate at end; head and thorax with white hair; legs with white hair, slightly creamy on tibiae and tarsi, hair on inner side of hind tarsi ferruginous; tegulae translucent ferruginous; wings hyaline, nervures piceous; abdomen densely covered with appressed creamy-white hair; triangular patch on fifth segment small and pale fulvous.

This appears at first sight to be the female of *A. pachyodonta*, but it certainly is distinct. In *pachyodonta* the first recurrent nervure joins the second submarginal cell about the beginning of its last third, in *xanthochlora* at or beyond beginning of last fourth. In *pachyodonta* the labrum is depressed and shining in middle, in *xanthochlora* it is rugose, and also not trilobed at apex. *A. xanthochlora* is also related to *A. arthuri* Ckll. from Colorado, but is larger. In *arthuri* the face-marks are very pale yellow, and the lower inner angles of the black on clypeus are acute; in *xanthochlora* the face-marks are bright yellow, and the lower inner corners of black on clypeus are very obtuse.

Type: Female, No. 939, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, July 3, 1921, at Willard's Point Bay, Tiburon Island, Gulf of California.

16. *Anthophora estebana* Cockerell, new species

Male: Length about 10 mm.; black, with rather narrow band on clypeus (broadened in middle), labrum (except two large spots and narrow apical margin), mandibles (except apex) and narrow line on scape, all pale yellow; flagellum black, faintly reddish beneath; eyes pea-green; hair of head and thorax white, a little black intermixed on mesothorax and scutellum; legs with pale hairs, dull fulvous on inner side of tarsi; middle tarsi long, but not excessively so; tegulae testaceous; wings hyaline, nervures piceous; abdomen with entire white hair-bands; apex quadridentate, the middle teeth light red and obtuse, the outer black and sharp, curved inward. The scape may be entirely black. The labrum is trilobed at apex.

Closely related to *A. peritomæ* (Ckll.), but the face-marks are much brighter yellow, the apical teeth of abdomen are much larger, and the abdominal bands are narrower.

Type: Male, No. 940, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 19, 1921, on San Esteban Island, Gulf of California. Another male obtained at same time.

17. *Anthophora hololeuca* Cockerell, new species

Female: Length about 8 mm.; black, with a very broad apical band on clypeus, sending a broad lobe upward in median line, labrum (except two small spots and apical margin), and mandibles (except apex), cream-color; flagellum ferruginous beneath except at base; third antennal joint very slender; hair of head, thorax, abdomen and legs pure white, ferruginous on inner side of tarsi; abdomen entirely covered with appressed hair, the patch on fifth segment hardly darkened; eyes pale gray; head very broad; tegulae testaceous hyaline; wings hyaline, nervures brown, stigma red, marginal cell very short; tibiae at apex, and tarsi ferruginous. The clypeal mark varies greatly.

Male: Length about 6.5 mm.; face entirely covered with silky white hair; labrum and mandibles yellowish-white, but clypeus with only a small light spot; middle tarsi ordinary; apex of abdomen with a short, rounded red plate, and close to it on either side, a slender spine-like red tooth. Hair of abdomen occasionally (Tiburon Island) fulvous.

A remarkable feature in both sexes is that the scape is densely covered in front with pure white hair, which produces the same effect as a tegumentary white stripe.

At Puerto Refugio, Angel de la Guardia Island, one male and fifteen females were taken at flowers of *Parosela spinosa*. Other localities are Gonzales Bay, April 29, two females; Freshwater Bay, Tiburon Island, April 23, three females, four males; Pond Island Bay, Angel de la Guardia Island, June 30, three males; Loreto, May 20, 1 male; San Nicolas Bay, May 16. Related to *A. arthuri* Ckll., *A. albata* Cress., and *A. petrophila* Ckll., but quite distinct. The broader head (female) and color of tarsi distinguish it from *arthuri*. The tarsi and hair on fifth abdominal segment separate it from *albata*. The red tarsi and armature of male abdomen at once separate it from *petrophila*.

Type: Female, No. 941, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 29, 1921, at Puerto Refugio, Angel de la Guardia Island, Gulf of California.

The above species of *Anthophora* may be separated by means of the following table:

Clypeus entirely white.....	1
Clypeus not thus white.....	2
1. Hair on inner side of hind tarsi black.....	<i>phenax</i> Ckll.
Hair on inner side of hind tarsi pale fulvous.....	<i>leucostomella</i> Ckll.
2. Abdomen covered with very short white or whitish pubescence..	3
Abdomen distinctly banded, not wholly covered with pale hair..	5
3. Face-marks cream-color; flagellum red beneath.....	<i>hololeuca</i> Ckll.
Face-marks bright yellow.....	4

4. Eyes reddish brown; flagellum pure black...*pachyodonta* Ckll. ♂
 Eyes pea-green; flagellum obscurely reddish beneath.....
*xanthochlora* Ckll. ♀
5. Eyes pea-green (becoming brown in cyanide specimens); apex of
 abdomen without spines.....*curta* Prov. ♀
6. Apex of abdomen with spines..... 6
*curta* Prov. ♂
 Apex of abdomen with four spines.....*estebana* Ckll. ♂

EXOMALOPSIS Spinola

18. *Exomalopsis pulchella arida* Cockerell, new subspecies

Female: Length about 6.5 mm.; agreeing with *E. pulchella* Cresson (type locality Cuba), except that the pale hair of thorax is white, that on scutellum pure white, not at all fulvous, the wings not so dark apically, the hair-bands on abdomen white (not yellowish), and the long scopa on hind tarsi pale gray. From the Brazilian *E. manni* (Ckll.) it differs by the lack of black hair on scutellum, of fulvous hair at apex of abdomen, etc.

It is possible that the characters of this form are due to the direct effect of the environment.

Type: Female, No. 942, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 14, 1921, at Mulegé, Lower California.

19. *Exomalopsis similis* Cresson

Guaymas, April 8, one female; Bay at south end of Tiburon Island, July 4, 1921, one female. Differs from *pulchella* by having the long scopa of hind legs pale ferruginous instead of black or sooty. It is perhaps only a subspecies or variety.

ANCYLOSCELES Haliday

For the true characters and position of this genus see Entomological News, 1921, p. 76.

20. *Ancylosceles melanostoma* Cockerell, new species

Male (type): Length about 6 mm.; similar to *A. armata* Smith, but the antennæ, clypeus, labrum and mandibles black; eyes dark gray; stigma piceous; tegulæ piceous.

Female: Length about 7.5 mm.; similar to *A. armata*, but mesothorax more shining; antennæ dark and mandibles black.

It is surprising to find this more melanic than the common tropical *A. armata*.

Type: Male, No. 943, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 3, 1921, at **La Paz, Lower California**. A female was obtained at the same time.

The following table separates this from a series of related species which I have recently erroneously referred to *Leptergatis*:

Males	1
Females	5
1. Hind basitarsi piceous; clypeus entirely black... <i>wheeleri</i> (Ckll.) Hind basitari ferruginous.....	2
2. Clypeus with an apical transverse whitish band; labrum whitish <i>armata</i> Smith Clypeus entirely black.....	3
3. Labrum with a large round cream-colored spot; thorn-like tooth on hind basitarsus smaller..... <i>toluca</i> (Cresson) Labrum entirely black; thorn-like tooth larger.....	4
4. Mandibles with a large cream-colored spot; wings smoky..... <i>globulifera</i> (Ckll.) Mandibles entirely black; wings clear..... <i>melanostoma</i> Ckll.	
5. Antennæ black; flagellum obscurely reddish beneath..... <i>melanostoma</i> Ckll. Antennæ bright ferruginous beneath..... <i>armata</i> Sm. and <i>globulifera</i> (Ckll.)	

DIADASIA Patton

21. *Diadasia australis petrinus* Cockerell, new subspecies

Female (type): Size and general appearance of the Californian *D. australis opuntiae* Ckll., but with the tegulae black or brownish black and the elevated black areas at sides of second and third abdominal segments dull and covered with short black hair instead of polished and shining. The abdominal banding is very distinct.

Male: Distinguished by the dark tegulae and the process at end of hind basitarsus pure black.

San Pedro Martir Island, April 18, 1921 (type locality), 16 females, 5 males (Van Duzee), at flowers of *Abutilon*. There is also a smaller female scarcely over 12 mm. long, from La Paz, June 3. A female from Guaymas, April 7, is small, like *D. australis rinconis* Ckll., but has dark tegulae. It is intermediate between *petrinus* and *rinconis*.

Type: Female, No. 944, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 18, 1921, on **San Pedro Martir Island, Gulf of California**.

22. *Diadasia diminuta* Cresson

San Francisquito Bay, May 10, one male.

The above species may be separated thus:

Length less than 9 mm.....	<i>diminuta</i> (Cress.) ♂	
Length 12 mm. or over.....		1
1. Abdomen appearing black-banded from lack of pale hairs at bases of segments	<i>australis petrinus</i> Ckll. ♀	
Abdomen with pale hairs all over.....	<i>australis petrinus</i> Ckll. ♂	

MELISSODES Romand

23. *Melissodes communis gratior* Cockerell, new subspecies

Female (type): Length about 10 mm.; mandibles red in middle; head very broad, face and front covered with white hair; cheeks and occiput with white hair, but vertex with long black hair; thorax anterior to middle of tegulæ with pale fulvous hair, bright at sides; scutellum and disc of mesothorax (but separated from tegulæ by space equal to latter) with black hair; tegulæ ferruginous; wings faintly dusky, not yellowish; flagellum dusky reddish beneath, except at base; hair on outer side of hind tibiæ and tarsi white, on inner side (except base of tibiæ) orange-fulvous; hair bands of abdomen rather narrow, straight, white, very faintly tinged with yellowish.

Male: Clypeus, labrum and large spot on base of mandibles lemon yellow; tibiæ at apex and all the tarsi, ferruginous; hair of mesothorax pale fulvous, except a transverse band of black posteriorly; scutellum with much black hair; flagellum very long, clear fulvous, black above. Hind margins of abdominal segments more or less brownish or pallid.

Guaymas (type locality), April 8 and 11 (Van Duzee). Two females (one with hair on thorax in front paler fulvous than in the other) and 12 males (two of which have dark tegulæ). Four females from San Francisquito Bay, June 23, and La Paz, June 4 and 5, somewhat larger and more robust than the Guaymas ones, have dark tegulæ, and the hair of the thorax in front with only a very slight yellowish tint. The numerous males are certainly all conspecific, but they differ in the length and stoutness of the antennæ, though in all the antennæ are very long. They also differ in the color of the tegulæ as follows:

Tegulæ reddish; 10 from Guaymas, April 8 and 9; 3 from Tiburon Island, July 4; one from Pond Island Bay, Angel de la Guardia Island, July 1.

Tegulae dark; five from Pond Island Bay, Angel de la Guardia Island, July 1; two from Guaymas, April 8 and 15; one from Puerto Refugio, Angel de la Guardia Island, June 29; one from San Marcos Island, June 19.

Robertson noticed similar variation in a related form occurring in Illinois and gave it the name *M. variabilis*.

Type: Female, No. 945, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 11, 1921, at **Guaymas, Sonora, Mexico**.

24. *Melissodes catalinensis vanduzeei* Cockerell, n. subsp.

Female: Eyes brown, evidently reddish in life (in *catalinensis* they appear to have been green in life); depression on second abdominal segment broader in middle, the band more arcuate; abdominal bands nearly white (instead of fulvous tinted); hind margin of first abdominal segment not rufous.

Angeles Bay, June 26, 1921, (Van Duzee), one female. *M. catalinensis* (Ckll.) was described from Catalina Island, California, as *M. intermediella catalinensis*. Later it was referred to *M. humilior* Ckll. as a subspecies. Renewed comparisons indicate that it is a distinct species, distinguished by the robust flagellum and very small hind knee-plate.

Type: Female, No. 946, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 26, 1921, at **Angeles Bay, Lower California**.

M. c. vanduzeei differs from various similar species thus:

- (1) From *M. confusiformis* Ckll. by the white (not red) hair on hind tibiae and tarsi; much narrower, pure black, apical plate of abdomen, and more arcuate band across second segment.
- (2) From *M. pallidicincta* Ckll. by the much narrower head.
- (3) It is smaller than *nigrosignata* Ckll., and the apical plate is quite different.
- (4) The apical plate agrees with *grindeliae* Ckll., which is allied, but it differs from *grindeliae* by the less transverse head, color of eyes, light hair on outer side of middle tarsi, and arcuate band on second abdominal segment.
- (5) It differs from *humilior* Ckll. by the very small hind knee-plate, color of eyes, and much more robust flagellum.
- (6) From *intermediella* Ckll. by the large amount of white hair at sides of fifth abdominal segment, much broader depression on second abdominal segment, color of eyes, long black hair on vertex, and dark stigma and nervures.

25. *Melissodes callophila* Cockerell, new species

Female: Length about 11 mm., anterior wing 8; black, not very robust, the head and thorax with long shaggy white hair, the posterior disk of mesothorax and anterior part of scutellum bare and shining, with widely scattered punctures; labrum with sparse yellowish hair, and furnished at apex with a rather large light red dentiform process; head very broad, facial quadrangle broader than long; eyes pale gray, slightly greenish (in the dry state); clypeus convex, shining, with small, moderately close punctures; mandibles black, with an obscure reddish band; flagellum dark obscure red beneath, except at base; tegulae densely covered with pale hairs, except a shining exposed reddish area; wings faintly dusky, nervures and stigma piceous; third submarginal cell very broad above; marginal cell very obtuse at end; legs with pale hair, red on inner side of tarsi; anterior tarsi with dark brownish hair on outer side; hind legs with scopa filled with sticky bright orange-red (probably solanaceous) pollen, as in *Centris vanduzeei*; abdomen with hind margins of segments dark, second very narrowly brownish; second segment rugulose from very fine punctures; first segment with long white hair except apically; second and third each with a single broad even basal band of white tomentum, extended caudad at sides, but no median or marginal bands; fourth segment covered with white tomentum, except a transverse band in middle, not reaching sides; fifth and sixth with pure black hair, except a tuft of white at extreme sides.

Type: Female, No. 947, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 28, 1921, at San José Island, Gulf of California.

26. *Melissodes callophila nanula* Cockerell, new subspecies

Female: Length 9 mm.; slender; mandibles simple; maxillary palpi 4-jointed, the joints measuring in microns (1) 145, (2) 95, (3) 80; (4) 80; hair on inner side of hind tarsi partly red and partly dark fuscous, the general effect dark reddish; eyes reddish-gray.

Type: Female, No. 948, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 28, 1921, on San José Island, Gulf of California.

An isolated species, not close to any known to me. The abdominal banding suggests *Tetralonia*, but the maxillary palpi (which I examined in var. *nanula*) have only four joints. The variety looks distinct but differs in no essential character except size. It may represent a small race with a different food-plant, or it may be merely an individual variation. In my tables in *Trans. Amer. Ent. Soc.*, xxxii (1906) this falls in group J (p. 84) if the hair on inner side of hind tarsi is considered red. Among the *Melissodes* there listed,

it falls near *M. tepaneca* and *M. galvestonensis* but is very distinct. If placed in group K it fits no better.

27. *Melissodes idonea* Cockerell, new species

Male: Length 10 mm., or rather more; black, including clypeus, labrum and mandibles (except subapical dark red band), but antennæ very peculiar; scape short and stout, shining black; flagellum long (about 7 mm.) and slender, the first two short joints black, the others pale orange, suffusedly blackened behind, the dark color fading toward apex of antennæ, so that beyond the middle the flagellum is dull orange behind, except that just before the apex it is broadly black on both sides, but the extreme apex is orange, and is slightly hooked; head broad; eyes dull yellowish green; hair of face and front entirely black, of cheeks and occiput white; labrum shining; clypeus shining, with scattered minute punctures; hair of thorax long and white, a little dusky on posterior middle of mesothorax; tegulæ piceous, with much pale hair; wings clear hyaline, unusually pointed, nervures and stigma ferruginous, the outermost nervures infuscated; legs black with white hair, ferruginous on inner side of hind tarsi; abdomen black, the hind margins of segments dark; first segment with long white hair; second and third each with a broad even basal band of white tomentum, curved posteriorly at sides; fourth covered with white hair; fifth with an apical white hair-band, and thin hair anterior to this in middle; sixth broadly fringed with white hair.

Another quite isolated species, with no known close relatives. From the locality and abdominal banding I wondered whether it could not be the male of *M. callophila*. This may indeed be the case, but the difference in the wings is so striking that I can only treat them as distinct, in the absence of any proof to the contrary.

Type: Male, No. 949, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 28, 1921, on **San José Island, Gulf of California**. Two males obtained.

The above species of *Melissodes* may be separated by the following table:

Females; clypeus black, antennæ short.....	1
Males; antennæ long.....	4
1. Hair of scutellum white.....	2
Scutellum with much black hair.....	3
2. Length 11 mm., or rather more.....	<i>callophila</i> Ckll.
Length 9 mm.....	<i>callophila nanula</i> Ckll.
3. Hind hasitarsi with black hair on inner side; clypeus brown or reddish.....	<i>catalinensis vanduzeei</i> Ckll.
Hind hasitarsi with clear ferruginous hair on inner side; eyes gray or black, not brown or reddish.....	<i>communis gratior</i> Ckll.
4. Clypeus black; face and front with black hair.....	<i>idonea</i> Ckll.
Clypeus yellow.....	<i>communis gratior</i> Ckll. ♂

MEGACHILIDÆ

STELIDINÆ

28. *Stelis perpulchra* Crawford

Agua Verde, Lower California, May 28, two males, three females; Mulegé, Lower California, June 3-5, 10 males; Guadalupe Point, Concepcion Bay, June 17, six males; Coyote Cove, Concepcion Bay, June 18, one male; Angeles Bay, June 26, one male; Puerto Ballandra, Carmen Island, May 22, one male; Las Animas Bay, May 8, two males. Previously known only from two males, the type from Yuma, Arizona, and one from an unknown locality in Arizona. The female is about 10 mm. long, marked like the male. A transverse yellow line behind the ocelli may be present or absent. The males vary in size.

ANTHIDIINÆ

DIANTHIDIUM Cockerell

Subgenus ANTHIDIELLUM Cockerell

29. *Dianthidium ehrhorni* Cockerell

Angeles Bay, May 5, one male; known from southern California.

30. *Dianthidium eiseni* Cockerell

Angeles Bay, June 26, two females; Tiburon Island (bay at south end), July 5, one female; La Paz, June 3-5, three males. Described from San José del Cabo, Lower California. It was originally recorded by Fox as a variety of *notatum*. The male has the anterior tibiæ yellow in front; those of the type, described as light ferruginous, were probably discolored. The female has the face black except for the large lateral marks. In both sexes the axillæ may have a very small yellow spot. The species is very close to the Californian *D. robertsoni* Cockerell, but the female is easily distinguished by the widely separated spots on abdominal segments three and following, the sixth segment all black and the tibiæ and tarsi not red. In the male the lateral spots of supraclypeal area are confined to the corners, and do not at all approach the middle line.

Subgenus DIANTHIDIUM Cockerell

31. *Dianthidium platyurum* Cockerell, new species

Male (type): Length about 9 mm. (abdomen curved downward); black, with pale yellow markings; eyes dark slate-color or slightly reddish; clypeus pale yellow, with or without a very small bilobed black mark on upper border; lateral face-marks going nearly to top of eyes; a stripe behind upper part of eyes, but none on occiput; mandibles mainly yellow on outer side; front, vertex, mesothorax and scutellum finely and densely punctured; two spots on mesothorax anteriorly, axillæ, an interrupted band on scutellum, large mark on the expanded sharp-edged tubercles, and large mark on the otherwise dark tegulæ, all pale yellow; mesopleura immaculate, with coarse punctures; wings dusky fuliginous, with purple iridescence in marginal cell; knees and mark at base of each tibia pale yellow, a minute round spot near apex of middle tibiæ, and a short line at base of their basitarsi; hind basitarsi mainly yellow on outer side; hind coxæ with yellow spines; abdomen shining, with large, not very dense, punctures; first segment with a short median band, and on each side a subquadrate patch, emarginate mesad; second segment similarly ornamented, but the median band narrowly interrupted in middle and the lateral marks shoe-shaped; third and fourth segments each with a pair of large bridge-shaped marks; fifth with a pair of spots in middle and a dot at each side; sixth entirely black; seventh pale yellow, broad, truncate, with rounded corners, with a rather small median lobe.

Female: Length about 8 mm.; clypeus and mandibles entirely black; a small vertical yellow line below middle ocellus; band on middle of second abdominal segment more broadly interrupted, the divisions pointed mesad; fifth segment with two large subtriangular patches and no lateral dots; basitarsi entirely black; mesopleura with a very small pale yellow mark.

San Francisquito Bay, Lower California, May 10, one male, one female, and June 23, one male.

Very closely related to *D. pudicum* Cresson, from the western United States, but the end of the male abdomen is much less trilobed, and the female has the mesothorax more finely punctured, and no light marks at sides of clypeus. The yellow markings are much paler than in *D. provancheri* Titus, and the mesopleura is much more heavily punctured.

Type: Male, No. 950, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 10, 1921, at San Francisquito Bay, Lower California.

32. *Dianthidium profugum* Cockerell, new species

Female: Length about 8.5 mm.; similar to *D. platyurum*, differing thus: wings not so dark; tegulæ clear ferruginous, with a cream-colored mark; extreme sides of clypeus usually with pale marks; anterior tibia

with pale stripe extending two-thirds down, and middle tibiae with a stripe the whole length; axillae with only a linear mark; mesopleura immaculate, with a good deal of white hair. The markings of the abdomen are very pale with a buffy tint instead of clear yellow. Ventral scopa pale fulvous.

Puerto Refugio, Angel de la Guardia Island, June 29 and May 1, three females. The June 29 specimen was taken on flowers of *Dahlia spinosa*.

Type: Female, No. 951, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 1, 1921, at Puerto Refugio, Angel de la Guardia Island, Gulf of California.

ANTHIDIUM Fabricius

33. *Anthidium lupinellum* Cockerell

San Francisquito Bay, Gulf of California, May 10, one worn male. This species was described from New Mexico and the specimen collected by Mr. Van Duzee differs in the distinctly paler wings (marginal cell with only a narrow brown stripe along upper edge), hair of vertex white, all the tibiae with a small yellow spot at base, lateral face-marks forming a somewhat larger angle on orbits above, and lateral apical spines of abdomen rather longer and more slender. Whether these differences indicate a distinct race or are merely individual cannot be determined until more specimens are available. The scape is entirely black, in the male of the following species it is yellow in front.

34. *Anthidium sonorensis* Cockerell, new species

Male (type): Length about 11 mm.; robust, black with yellow markings, pale on face but deep chrome-yellow on abdomen; hair of head and thorax abundant, on vertex, mesothorax and scutellum fulvous, elsewhere white; clypeus, triangular lateral face-marks (their upper ends broadly rounded at about level of antennae), mandibles (except apex), a small elongated mark above each eye, and scape in front, all yellow; eyes green; top of head dull and granular, with a shining space laterad of each outer ocellus; mesothorax and scutellum dull and granular, the former entirely black, as also the axillae, but scutellum with a yellow band, greatly constricted in middle, making the scutellum appear as if deeply emarginate; tegulae black with two yellow spots; tubercles with an orange spot; wings dilute fuliginous; knees, tibiae on outer side and the basitarsi densely covered with white hair; hind coxae with a yellow spot; abdomen shining, very finely punctured; segments one to five each with four, nearly equidistant, yellow spots, the median ones

on first segment small, but the laterals on this segment very large and quadrate; on fifth segment the median spots are connected with the laterals by a line and on fourth they are nearly connected; sixth with large quadrate median spots, and small laterals; seventh black with a pair of yellow dots; venter with white hair; sixth segment with sharp, slightly curved, spines at sides; seventh with a slender median spine, and rather narrow, somewhat pointed, lateral lobes, their outer margin straight.

One male. The end of the abdomen is formed nearly as in *A. banningense* Cockerell, from California, but the markings of the thorax and abdomen are conspicuously different. *A. banningense* has the scape entirely black. There is also some resemblance to *A. savorum* Cockerell and *A. collectum* Huard, but these are readily separated by the apex of the abdomen.

Type: Male, No. 952, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 8, 1921, at **Guaymas, Sonora, Mexico.**

The following females from quite other localities are referred to this species, though there is a possibility that they may be distinct:

Female: Length about 10 mm.; similar to the male except in characters which may be regarded as sexual; scape black, with a small yellow streak; clypeus yellow, with a pair of short, thick, black bars on upper part; eyes green; broad yellow stripe behind sides of vertex; hair of vertex brown, but of occiput, mesothorax and scutellum short and white; mesothorax with yellow stripes along margins above tegulae, and also at sides anteriorly; axillae yellow; wings rather clearer; abdominal markings yellow, not chrome or orange, more transverse, the median ones on first segment large, the medians connected with the laterals by a band on segments 3 to 5; sixth segment yellow with an angular median mark at base and a pair of small discal spots; apex of sixth segment obtusely pointed, and margins laterally distinctly angled; ventral scopa white.

Las Animas Bay, May 8, one female. The middle basitarsi are densely covered with white felt, as in *A. maculifrons* Smith, but that species differs greatly in the markings.

35. *Anthidium sonorensis productum* Cockerell, n.var. (?n.sp.)

Female: Similar, but whole middle of upper part of clypeus broadly black; scape entirely black; upper part of head immaculate, except small yellow dots above eyes; hair of vertex white; eyes reddish; anterior marks on mesothorax represented by minute dots, and lateral ones by very short stripes; marks on axillae smaller; band on scutellum much narrower, narrowly interrupted in middle; spots on first three abdominal segments all disconnected; sixth segment with a median black line.

San José Island, June 10, one female (type of variety). Another example from La Paz, June 3, has short stripes above the eyes, a long stripe above tegulæ, more yellow on axillæ and scutellum, and the yellow on abdomen more extensive, thus approaching the female described from Las Animas Bay.

Type: Female, No. 953, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 10, 1921, on San José Island, Gulf of California.

MELECTIDÆ

ERICROCIS Cresson

36. *Ericrocis arizonensis* Baker

Guaymas, April 11, 1921, one male. Described from Oracle, Arizona.

Fox described *E. rugosa* from Santa Maria, Lower California. Mr. Van Duzee has kindly compared the above *E. arizonensis* with Fox's type and reports: "This species has a strong superficial resemblance to the type of *Ericrocis rugosa* Fox, but as that was an alcoholic specimen the characters of the pile can scarcely be made out, while it is very clear and distinct in my specimen. My specimen is a little smaller, the dorsulum is much more strongly furrowed, the scutellum is less tumid either side than in the Fox type. The little pile remaining on the labrum of the Fox type is pale while it is long, heavy and fuscous in mine. In the type the first recurrent nervure unites almost exactly with the second transverse-cubital, exactly as it does in my specimen."

E. rugosa is doubtless a distinct species. As it stands at present *Ericrocis* consists of four species, *E. lata* (Cresson), Texas to Arizona; *E. arizonensis* Baker, Arizona and Sonora; *E. melectoides* Baker, Arizona; *E. rugosa* Fox, Lower California. *E. arizonensis* is close to *E. lata*, and possibly not to be separated, but it seems to be distinct.

TRIEPEOLUS Robertson

37. *Triepeolus verbesinæ* (Cockerell)

Guaymas, April 6, 8, and 15, six males; Angeles Bay, June 26, two females. Described from southern New Mexico. The scale-like spines on pygidial area (false pygidium) of

female are said in the original description to be brilliantly golden. They are actually dark but shine golden at a certain angle in bright light.

EPEOLUS Latreille

38. *Epeolus permixtus* Cockerell, new species

Male (type): Length about 10 mm.; robust, black, the light markings on abdomen cream-color, the legs red. Eyes dark grayish brown, converging below; face densely covered with appressed, pure white hair; mandibles chestnut red, black apically; labrum black with a red spot at each side; vertex shining, with sparse strong punctures; antennæ long, black, the first joint mainly red, shorter than the fourth; pale hairs of thorax dorsally pale ochreous-tinted, ventrally white; mesothorax with a pale margin posteriorly and laterally, the pale hair ending in a point anteromesad, leaving a black band between it and the anterior margin; stripes on disc of mesothorax long and broad, tapering at each end, the anterior end reaching the anterior margin; between the bands along the middle line is a little light hair and there is a very broad triangle of thin pale hair between the bands along the anterior margin, and some very thin pale hair laterad of the bands anteriorly; axillar teeth short, but well developed; pleura with the lower part appearing dark, but thinly covered with hair; tegulæ dusky red; wings hyaline, darkened apically, stigma and nervures black; recurrent nervures joining submarginal cells at middle; hind tibiæ with a black patch behind; hind basitarsi with orange hair on inner side; spurs dark red; abdomen with entire bands on all the segments except first, where it is narrowly interrupted; black area on first segment a transverse band, pointed laterally, the whole band somewhat semilunar in outline; second segment with black area obtusely pointed (at about 50 degrees) laterally; band on sixth segment white, contrasting with the others; first ventral segment with a small broad white discal triangle; second and third ventrals with much white hair along margins and in middle line; curled fringes pale brownish, the second one darker; apical plate rather broad, dark reddish.

Female: Length about 8.5 mm. (Las Animas Bay) to 10 mm. (Pond Island Bay); similar to the male but differing thus: First three antennal joints chestnut-red in front; stripes on mesothorax short, not nearly reaching anterior margin; lateral pale bands broken above tegulæ, and ending obtusely just in front of tegulæ, not at all pointed mesad; no scattered pale hair on anterior part of mesothorax; less pale hair along base of scutellum; upper part of dark area on pleura bare, shining and rather closely punctured; fifth abdominal segment with a comparatively large false pygidium, extending to the base of the segment; broad white bands on ventral segments 2 to 4.

Pond Island Bay, Angel de la Guardia Island, Gulf of California (type locality), July 1, 1921, two males, one female; Angeles Bay, Lower California, June 27, 1921, one female. The last mentioned specimen is much smaller but

apparently conspecific. The sexual difference in the marking of the mesothorax is similar to that in *Triepcolus panepectoralis* Viereck.

This is a remarkable species because, although the false pygidium is rather small for *Triepcolus*, it is distinctly of the type of that genus; while the maxillary palpi (examined in both sexes) are only two jointed, the first joint cup-shaped apically, the second long and cylindrical. Hence it resembles *Epeolus dacotensis* Stevens, but that species is otherwise so different as to suggest that it may have been derived independently from *Triepcolus*.

Superficially *E. permirtus* is very like the Mexican *Triepcolus concinnus* Cockerell, but the latter has much larger false pygidium and is a genuine *Triepcolus*.

Type: Male, No. 954, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, July 1, 1921, at **Pond Island Bay, Angel de la Guardia Island, Gulf of California.**

PANURGIDÆ

The Panurgid bees collected by Mr. E. P. Van Duzee in the region of the Gulf of California include one *Spinoliella* and eight species of *Perdita*. Of these, four species of *Perdita* and a subspecies each of *Perdita* and *Spinoliella*, are new. In April, 1898, Dr. L. O. Howard collected eight species of *Perdita* at San José de Guaymas, Mexico. Four of these were described as new, *P. howardi* Ckll., *P. ashmeadi* Ckll., *P. sonorensis* Ckll. and *P. lucia* Ckll. The others were *P. tarda* Ckll. (not typical), *P. punctosignata* Ckll., *P. salicis* Ckll. and *P. exclamans* Ckll.

The collection described below includes five species of *Perdita* from Guaymas, one new, one described as a new subspecies of *P. exclamans*, and the other three, *sonorensis*, *punctosignata* and *howardi*. *P. lucia* also occurs in Arizona, where it was collected by Mr. H. G. Hubbard. *P. howardi* extends to New Mexico. The earlier reports of Mr. Wm. J. Fox on the Hymenoptera of the Gulf of California and adjacent Mexico include the following Panurgidæ:

- Calliopsis*, n. sp. (not described). San Julio.
Calliopsis margaritensis Fox. Margarita Island; now referred to *Panurginus*.
Calliopsis concinnus Fox. El Chinche; now called *Panurginus concinnus*.
Calliopsis scaber Fox. El Taste, 3400 ft.; now called *Pseudopanurgus scaber*.
Calliopsis mexicana Cress. Tepic; now called *Pseudopanurgus mexicanus*.
Perdita sp. Tepic.
Perdita ventralis Fox. Magdalena Island, Margarita Island.
Perdita sparsa Fox. Margarita and Magdalena Islands.
Perdita arcuata Fox. Calmalli Mines.
Perdita sp. Calmalli Mines.
Panurgus sp. Magdalena Island. This could not have been a true *Panurgus*.

The *Panurgus halictoides* of Fox is to be called *Dialictus halictoides*, while *Panurgus manifestus* Fox is referred to *Callandrena*. These two species are Andrenids, not Panurgids.

It will be seen that Mr. Van Duzee did not find one of the species recorded by Fox, unless, perchance, one of the unnamed ones should be the same as one of his. The Panurgid fauna of the Gulf region is an extension of that of the arid southwestern United States, with some specific and subspecific differentiation. Some of the forms at present apparently confined to the peninsula or the Gulf region may yet be found in Arizona, the bee-fauna of which is still very imperfectly known.

PERDITA F. Smith

39. *Perdita sonorensis* Cockerell

Guaymas, Mexico, April 8, 1921, one female. A form with the light abdominal marks more reduced than usual.

40. *Perdita punctosignata* Cockerell

Guaymas, Mexico, April 10, 1921, three females, reddened by cyanide. Dr. L. O. Howard collected this species at San José de Guaymas, April 10, 1898.

41. *Perdita exclamans atramentata* Cockerell, new subspecies

Male: Apex of flagellum (one or two joints) black above and below, contrasting abruptly with the rest. Yellow of cheeks ending above very acutely, or as a line on posterior orbits.

Guaymas, Mexico, April 7, 1921, two males. By the black apex of antennæ this recalls the otherwise quite different *P. miricornis* Cockerell, from Wyoming.

Type: Male, No. 955, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 7, 1921, at Guaymas, Sonora, Mexico.

42. *Perdita howardi* Cockerell

Guaymas, Mexico, April 8, 1921, two males. Guadalupe Point, Concepcion Bay, June 17, 1921, one female; Las Animas Bay, May 8, 1921, one female, two males. The males from Guaymas differ from the others as shown in the table below, but a cotype male *howardi* (San José de Guaymas) has the margin of stigma slightly darkened, and traces of the lines laterad of ocelli. The females from Concepcion Bay and Las Animas Bay do not have the margin of the stigma darkened. It is thus impossible to distinguish any races. *P. howardi* extends northeast to southern New Mexico.

43. *Perdita vanduzeei* Cockerell, new species

Female: Length about 5 mm.; head and thorax brassy green, with rather abundant white hair; metathorax bluish green; clypeus and labrum black; no light face-markings; mandibles pellucid white, rufous apically; head broad; scape black, with a pale dot at base; flagellum pale yellowish beneath; front shining; mesothorax highly polished; tegulæ hyaline; wings pure hyaline, milky; nervures colorless; stigma very pale yellowish; legs black, anterior tibiæ pale yellow in front, their tarsi reddish; abdomen shining; first segment black; second and third black with very broad narrowly interrupted cream-colored bands, not reaching lateral margins; rest of abdomen bright ferruginous, except that fourth segment is black at extreme base and in middle, and has the interrupted pale band poorly developed; venter with basal two-thirds fuscous, apical third clear ferruginous.

One female. In the New Mexico tables it runs to *P. subfasciata* Ckll., but is very different. It is really very like *P. crotonis* Ckll., but is easily distinguished by the dark face. *P. crotonis* visits Croton in New Mexico from the end of June to August.

Type: Female, No. 956, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 25, 1921, at Tepoca Bay, Sonora, Mexico.

44. *Perdita clarifacies* Cockerell, new species

Male: Length about 4 mm.; head and thorax greenish blue, the metathorax and mesopleura steel-blue; head large and broad, cheeks unarmcd; face below level of antennæ (also labrum and basal half of mandibles) creamy-white, highly polished, with little hair; lateral marks forming broad-cuneate projections above this level, one each side on orbit, the apex nearly half way up front; cheeks entirely dark; scape short, creamy-white in front; flagellum pale dull reddish beneath; front shining; mesothorax highly polished; prothorax with a prominent yellowish white lobe at top on each side, the tubercles of the same color; wings clear, nervures fuscous, except the second recurrent which is pure hyaline; stigma dull white, bounded with fuscous; marginal cell rather long; legs yellow, anterior and middle femora marked with black behind, hind femora black behind and with a broad oblique black band in front; hind tibiæ broadly fuscous behind; abdomen dark brown, with interrupted straight yellow bands (pale dull chrome) on segments 2 to 6, the bands obtuse laterally and not nearly reaching lateral margins; venter pale yellowish, brownish apically.

One male. In the tables it runs nearest to *P. pectidis* Ckll. to which it is not closely allied. It is just possible that it is the male of *P. sonorensis*, but I think not, as the wings are clear and the marginal cell is conspicuously narrower.

Type: Male, No. 957, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 6, 1921, at Guaymas, Sonora, Mexico.

45. *Perdita vittata* Cockerell, new species

Female (type): Length about 5 mm.; head and thorax dark blue-green, metathorax dark steel-blue; head ordinary, face broad; labrum black; basal half of mandibles and face-markings very pale yellow, the latter consisting of an elongated median mark on clypeus, a large spot at each anterior corner of clypeus, not approaching the median mark, and much larger transverse lateral marks, angulate on orbits below level of antennæ; cheeks hairy, not at all swollen; front shining; scape black, with the base conspicuously pale yellow; flagellum dark brown above, pale yellow beneath; mesothorax shining, with thin, rather long hair; upper margin of prothorax narrowly yellow anteriorly, but posteriorly without markings; tubercles light yellow; tegulæ hyaline; wings clear hyaline, beautifully iridescent, stigma and nervures (except subcosta) colorless; marginal cell with poststigmatal part longer than substigmatal; femora black with knees yellow; anterior and middle tibiæ yellow, with a large dark patch behind, hind tibiæ dark; broadly yellow at base; anterior and middle tarsi yellow, hind tarsi dark; abdomen broad, first segment dark brown with two large, closely approximated oval or subpyriform pale yellow marks; second segment with anterior half dull pale yellowish or cream-color, the posterior half brown (posterior corners pallid), the brown with an upward projecting point in middle; re-

maining segments pale reddish, the third with a linear dark brown band at base, and two dark spots posteriorly; venter pale yellowish red.

Male: Similar, but labrum yellow; face all yellow to fully half-way up front; but not nearly reaching middle ocellus, the upper level of the yellow not far from straight, but depressed in middle and at extreme sides; antennæ entirely yellow, except that first few joints of flagellum are darkened above, lower part of cheeks yellow, a rather broad yellow band going less than half-way up posterior orbits; posterior border of prothorax above broadly yellow, interrupted in middle, but laterally with a linear connection with yellow of tubercles; lower border of stigma dusky; legs yellow, the hind femora nearly all black behind; hind trochanters yellow; abdomen nearly as in female, third segment broadly dusky at sides. In the specimen described the yellow band has been reddened by cyanide.

La Paz, Lower California, June 3 and 4, 1921, four females, one male. Allied to *P. rhodura* Ckll., but the face markings of the female are quite different. The male has the face markings practically as in *rhodura*, though they end at the facial foveæ instead of enclosing them as in *rhodura*. The male *rhodura* also differs from *vittata* in having a yellow mark on mesopleura and the hind tibiæ dark. *P. rhodura* is from New Mexico.

Type: Female, No. 958, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 4, 1921, at La Paz, Lower California.

46. *Perdita erudita* Cockerell, new species

Male: Length slightly over 5 mm.; head and thorax dark bluish green, front rather yellowish green, metathorax steel-blue; head enormous, quadrate, larger than thorax, cheeks unarmed; clypeus with very long linear lateral extensions; mandibles simple; labrum, mandibles (except black apex and reddish subapical suffusion), clypeus (except usual dots), transverse (obscure) supraclypeal band, large triangular dog-ear marks, and subquadrate lateral face-marks, all white with a slight creamy tint, the lateral marks suffusedly tinged with purplish, and ending above squarely at level of antennæ as do the other markings; cheeks swollen, slightly pallid at lower end; front somewhat shining but with a dull band from eye to eye, enclosing ocelli; vertex black, shining, with scattered punctures; scape with a pale brown apical spot; flagellum obscure brown beneath, appearing banded; mesothorax shining, sparsely and weakly punctured, its posterior disc and the scutellum black; tegulæ hyaline; tubercles white; wings clear hyaline, margin of stigma and marginal vein dusky; stigma as large as usual; marginal cell with poststigmatal portion longest; legs dark brown, with white hair, trochanters and basal part of femora suffusedly pallid above; anterior femora very broad, concave in front; abdomen short and very broad, piceous, with the hind margins of the segments broadly hyaline, the first three segments with a brown line just before the hyaline area; venter pale reddish brown.

A member of the *P. californica* group, but distinct from those previously described. The sculpture of the mesothorax in *P. californica* Cresson is different and the stigma is small. It is nearest to *P. crassiceps* Ckll., and *P. laticeps* Ckll. from New Mexico, especially to the latter, from which it differs in possessing dog-ear marks on the face. The cheeks of *P. crudita* have short, largely appressed hair, a character of *laticeps* as against *crassiceps*. The absence of a transverse ridge behind the ocelli, the punctures on vertex and the hyaline margins of the broad abdomen are all *laticeps* characters. Additional material may show that *P. erudita* is a subspecies of *laticeps*. The hair on thorax above is pure white, not brownish as in *P. crassiceps*.

Type: Male, No. 959, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 3, 1921, in Palm Cañon, Angel de la Guardia Island, Gulf of California.

The above species of *Perdita* may be separated as follows:

Thorax green or dark.....	1
Thorax yellow (may be reddened by cyanide).....	6
1. Abdomen dark without evident pale markings, but hind angles of segments hyaline; head extremely large..... <i>crudita</i> Ckll. ♂	
Abdomen with distinct pale markings, or mainly pale.....	2
2. Face without light marks; apical part of abdomen red.....	
..... <i>vanduzeei</i> Ckll. ♀	
Face dark with light marks.....	3
Face all pale.....	4
3. Light marks of abdomen reduced to pairs of small transverse marks on bases of segments 2 and 3; supraclypeal and dog-ear marks present..... <i>sonorensis</i> Ckll. ♀ (var.)	
Light marks or areas of abdomen much more extensive; no supraclypeal or dog-ear marks; extreme base of scape light....	
..... <i>vittata</i> Ckll. ♀	
4. Abdomen beyond third segment light, without bands.....	
..... <i>vittata</i> Ckll. ♂	
Abdomen beyond third segment dark or banded.....	5
5. Abdomen with three interrupted light bands..... <i>clarifacies</i> Ckll. ♂	
Abdomen with at least five entire yellow bands; flagellum with black apex..... <i>exclamans atramentata</i> Ckll. ♂	
6. Mesothorax with a pair of parallel black bands.....	
..... <i>punctosignata</i> Ckll.	
Mesothorax without such bands.....	7
7. Facial foveae elongate; a black stripe from each lateral ocellus to adjacent eye, (Conepcion Bay, Las Animas Bay).....	
..... <i>howardi</i> Ckll. ♀	
Facial foveae small, punctiform.....	8

8. Margin of stigma distinctly darkened; a black line extending laterad of each lateral ocellus, (Las Animas Bay).....
 *howardi* Ckll. ♂
 Margin of stigma not darkened; no black line from lateral ocelli (Guaymas).....*howardi* Ckll. ♂

SPINOLIELLA Ashmead

The status of this genus is rather uncertain. The type was given as *Camptopoeum nomioides* Spinola, a slip for *nomadoides*. This is a Chilean species with black head and thorax, the abdomen red with white or very pale marks. It is probably not very closely allied to the North American forms placed in *Spinoliella*. The type of *Camptopoeum*, designated by Taschenberg, is the European *frontalis* of Fabricius. For a discussion of this species see Trans. Amer. Ent. Soc., xxxi, (1905) p. 320. Ducke (1912) boldly submerges *Spinoliella* in *Camptopoeum*, but this is unsatisfactory. There are, I believe, three or four genera of this immediate alliance in the New World, and probably none of the nearctic or neotropical species belongs to the true *Camptopoeum*. *Spinoliella* therefore stands, and the only question is whether it should be subdivided.

A complication is introduced by Ashmead's genus *Nomadopsis*. The type is designated as *Perdita zonalis* Cresson, which puts it in another group. But the description refers to specimens from Los Angeles County, California, which Ashmead had determined as *Calliopsis zonalis* Cresson. He wrote *Perdita* through some confusion, arising from the fact that there is also a *Perdita zonalis* Cresson, a species which is not in the U. S. National Museum. I have one of these specimens and it is not even *Calliopsis zonalis*; it is with little or no doubt the male of *Spinoliella cuxantha* Ckll., described in 1916 from the female. In the face of all this confusion I think the name *Nomadopsis* may be dropped.

47. *Spinoliella scutellaris peninsularis* Cockerell, n. sp.

Female: Length 7.3 to 8 mm.; black, with cream-colored markings; hair of head and thorax above faintly tinted with pale ochreous; eyes pale green; tongue narrow, elongated, but hardly as long as width of face; labial palpi with first joint long and stout, much longer than the other three together, the second hardly longer than the third; max-

illary palpi long and very slender, 6-jointed, the first short, the second and third longest; labrum black with a shining basin; mandibles simple, cream-colored at base, red in middle, broadly black apically; clypeus broadly excavated apically with a narrow rufous margin, but otherwise cream-color, except two brown spots, and a large black apical area which is sharply bidentate below; large supraclypeal and dog-ear marks; lateral marks more or less semilunar, but excavated on inner side above, ending on orbits at about level of upper side of antennal sockets; malar space black; scape black with small apical and basal pale spots; flagellum broadly pale ferruginous beneath, dusky and banded basally; mesothorax polished with scattered small punctures; upper border of prothorax with an interrupted pale band, but tubercles dark; postscutellum and narrow line on posterior margin of scutellum cream-color; tegulae dark rufous, with a cream-colored stripe; wings hyaline with a faint reddish-gray color; stigma rather narrow, pale reddish; nervures pale fuscous; apex of marginal cell oblique; legs black, the tarsi more or less reddish, the knees and stripe on anterior tibiae cream-color; abdomen shining with broad cream-colored bands, broadly excavated sublaterally behind; band on first segment narrowly, and on second very broadly, interrupted; fifth segment without light markings.

La Paz, Lower California, June 4, 1921, six females. This is allied to *zonalis* (Cresson), as shown, for instance, by the color of the tegulae; but is especially related to *S. scutellaris* Fowler, based on males from Fresno, California. As the female of *scutellaris* is unknown comparisons are difficult, but to the best of my judgment part of the differences are sexual and part racial.

Type: Female, No. 960, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 3, 1921, at **La Paz, Lower California.**

ANDRENIDÆ

NOMINÆ

NOMIA Latreille

48. *Nomia californica* Cockerell

This was described in 1910 from the female collected in southern California. Six males from Las Animas Bay, Lower California, are referred here with confidence. They closely resemble *N. acus* Cockerell, differing by the color of the abdominal bands, the presence of a narrow but very distinct band on the first segment, and the very dark brown

tegulæ. The band on the first segment, as often happens in *Nomia*, sometimes fails to become colored. The wings agree with *californica*. *Nomia howardi* Crawford and *N. moctezuma* Crawford were taken by Dr. L. O. Howard at San José de Guaymas, Mexico, but were not met with by Mr. Van Duzee.

APIDÆ

APIS Linnæus

49. *Apis mellifera ligustica* Spinola

Tiburón Island, July 4, one worker. The genus *Apis* is not native in America.

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VIII
**EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹**

NEW DOLICHOPODIDÆ (Long-legged Flies)

BY
M. C. VAN DUZEE
Buffalo, N. Y.

1. *Asyndetus disjunctus* M. C. Van Duzee, new species

Male: Length 2.5 to 3 mm. Face and front wide, opaque with silvery white pollen. Palpi yellow with silvery white pollen and about six black hairs on their disk; probosis black. Antennæ black; third joint usually short and flattened in outline at tip, but sometimes rounded or even a little pointed; arista nearly apical, or subapical, its first joint short. Lateral and inferior orbital cilia white, increasing in length below; lower part of the head with quite an abundant long white beard. Thorax and scutellum thickly covered with white pollen, which almost conceals the coppery ground color; acrostichal bristles large, in a single row; prothorax with two black bristles above the base of the fore coxæ. Abdomen green with coppery reflections, clothed with coarse black hair and with considerable white pollen. Hypopygium concealed, its bristles long and stout.

Coxæ and femora metallic green; trochanters and knees yellowish; coxæ with black bristles, the fore pair with a few stiff black hairs on the anterior surface. All femora with coarse black hair and two rows of long hairs or slender bristles on lower surface, these about half, or more than half, as long as width of femora. Fore tibiæ yellow with conspicuous black hair and a few bristles; middle pair yellow with apical fourth brown, their bristles long; hind tibiæ mostly blackish, more or less yellow on upper edge of basal half, with two rows of bristles. Fore and middle tarsi nearly one and a half times as long as their tibiæ, black, more yellowish brown at base; hind tarsi about as long as their

¹A map showing the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings. Copies of which can be supplied at nominal cost.

June 7, 1923

tibiæ, wholly black, all their joints gradually decreasing in length; fifth joint of all tarsi slightly flattened so as to appear nearly round when viewed from above; all pulvilli much enlarged, longer than fifth joint, yellow. Calypters, their cillia and the halteres pale yellow.

Wings grayish hyaline, veins brown, yellow at root of the wings; sometimes the alternate veins more yellowish; third vein running close to second and parallel with it as far as its tip, then bending backward so that it ends about half way from the tip of second to the apex of the wing; the thin fourth vein broken opposite the end of second, its apical portion far forward of the basal part but nearly parallel with it, ending in the apex of the wing, this apical portion very slender, almost invisible at tip but extending over first part at its basal end; sixth vein conspicuous; posterior cross-vein about opposite the apical third of first vein.

Female: One female taken at Tepoca Bay, Sonora, April 25, agrees with the male described above in having the same silvery pollen on its face, front and body; the color of the legs is about the same and it has white palpi which are a little smaller; the third antennal joint is smaller, the arista dorsal; the last section of the fourth vein is scarcely broken and is a little stronger. This female measures only 2 mm. and I think there can be no doubt but it belongs to the same species with the males described above.

Described from 15 males and one female. The males were taken at Puerto Refugio, Angel de la Guardia Island, June 29. The larger specimens seem to be more hairy than the smaller. Although there is no doubt they are all of one species I am choosing the holotype from the large ones.

Type: Male, No. 961, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 29, 1921, at Puerto Refugio, Angel de la Guardia Island, Gulf of California.

2. *Asyndetus terminalis* M. C. Van Duzee, new species

Male: Length 2 mm. Face and front wide, the latter slightly wider above, covered with thick black pollen; palpi black, edged with yellow and covered with white pollen. Antennæ black; third joint small, rounded at tip; lower orbital cilia white. Thorax and scutellum so thickly covered with white pollen as almost to conceal the metallic ground color; pollen on center of dorsum brown, contrasting with the white on the rest of the dorsum; acrostichal bristles six, in a single row. Abdomen green, covered with thin white pollen and black hairs; bristles at its tip stout. Hypopygium small.

Coxæ and femora metallic green; fore femora with a row of delicate hairs below; hind femora nearly bare below. Trochanters, extreme tips of the femora, and all the tibiæ yellow; fore tibiæ without bristles; middle pair with one bristle near the base in front and one at the middle above; hind ones with several slender bristles which are black at tip for one fourth their length; fore and middle tarsi black from tip of first joint, the former one and a fourth, the latter one and a half times

as long as their tibiæ; hind tarsi wholly black, about equal to their tibiæ in length; all pulvilli distinctly enlarged, dark yellow. Calypters, their cilia and the halteres yellow.

Wings a little grayish; veins brown, yellow at root of the wings; third vein nearly straight to its tip, parallel with second; fourth vein broken, its apical portion placed in front of basal part but very nearly parallel with it, ending in the apex of the wing; posterior cross vein nearly opposite apical third of first vein.

Female: Face and front as in male, the bronze ground color showing through a little on the front; third antennal joint smaller, the arista placed at its base above; third vein of wing a little more bent at tip; legs colored as in male.

Described from one male and two females. The male was taken at Puerto Refugio, Angel de la Guardia Island, June 29. One female was taken at Mulegé, Lower California, May 14. Another female, taken at Gualan, Guatemala, October 22, 1905, is in my own collection.

Type: Male, No. 962, and *allotype*, female, No. 963, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 29, 1921, at Puerto Refugio, Angel de la Guardia Island, Gulf of California.

This form, together with *interruptus* Loew, *latus* Van Duzee, and *disjunctus*, new species, form a group having the front and face very wide, with their sides nearly parallel and completely covered with white pollen so as to conceal the ground color, or very nearly so. In this group, *interruptus* is at once separated by its having the tibiæ black with more or less metallic green reflections; they are without yellow, except the extreme knees, and the thorax has the pollen less thick than any others except *latus*; of this form I have seen one or two males from the east and two females from California. *Disjunctus* differs from all others in the group in having large white or yellow palpi in both male and female; from *latus* and *terminalis* it differs in both sexes by having the hind tibiæ black with the upper edge yellowish on basal half above only, while in the other two the hind tibiæ are yellow with about apical fourth black. *Terminalis* is separated from all others in the group having the fore pulvilli small, not, or scarcely at all, enlarged; in having the third vein straight, not bent backward at tip, and in having the pollen on the center of the dorsum of the thorax brown, contrasting with the white pollen on the rest of the thorax; the female of *terminalis* is

very much like that of *latus*, the legs of both being colored alike, and, as the third vein bends backward in the female of *terminalis* more than it does in the male it cannot be separated on this character; the pollen on the dorsum of the thorax is also less brown in the female and less conspicuously different from that on the sides; the females can, however, be separated by the thicker pollen on the dorsum of the thorax of *terminalis*.

3. *Asyndetus brevimanus* M. C. Van Duzee, new species

Male: Length 2.5 mm. Face rather wide, blue-green, dulled with gray pollen; front shining metallic green; palpi brown; probosis black; antennæ black; third joint about one and a half times as long as wide, nearly straight above, rounded below so as to make the upper apical angle pointed; arista inserted near middle of upper edge of third joint; lateral and inferior orbital cilia sordid whitish. Thorax bright green with coppery reflections, slightly dulled with white pollen. Abdomen metallic green; apical segments and base of second and third coppery; the bristles at its tip stout but short; hypopygium small, mostly concealed.

Fore coxæ green with stiff black hairs or bristles; middle and hind ones black; all femora green, anterior pair with bristle-like black hairs below, which are longest near the base. All tibiæ dark yellowish; posterior pair black at tip. Fore tarsi about as long as their tibiæ, yellow at base, blackened from tip of first joint which is a little longer than the remaining four taken together; second and fifth of about equal length; third slightly shorter, the fourth still shorter, being about as long as thick. Middle tarsi as long as their tibiæ, yellow with last two joints blackened; second joint half as long as first; fourth shorter than fifth; hind tarsi wholly black, first and second joints of nearly equal length. Calypters, their cilia and the knobs of the halteres, pale yellow. Wings grayish, veins blackish; thin fourth vein bent, not broken, ending back of apex of wing; cross-vein nearly opposite middle of first vein.

Female: About as in male except that the third antennal joint is very short and rounded at tip.

Described from two males and three females taken at Tepoca Bay, Sonora.

Type: Male, No. 964, and *allotype*, female No. 965, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 25, 1921, at Tepoca Bay, Sonora, Mexico.

4. *Asyndetus singularis* M. C. Van Duzee, new species

Male: Length 2 mm. Face rather narrow for this genus, its sides parallel, dark green with a little white pollen, sometimes quite shining, hollowed longitudinally. Front shining blue-green, widened a little at vertex. Palpi and probosis black. Antennæ black; third joint but

little longer than wide, truncate at tip, making it appear subquadrate; second joint extending along upper edge of third nearly to its middle. Lateral and inferior orbital cilia white. Thorax and abdomen dark shining green, the former with a double coppery stripe on center of front half of dorsum, the latter with coppery incisures. Hypopygium small, its bristles very short.

Coxæ and femora metallic blue-green; fore and middle coxæ with a few black bristles. Lower edge of fore femora carrying a row of seven regularly placed bristles of uniform length, and scarcely longer than the hairs on the upper edge; middle femora with about 10 hairs or slender bristles on lower edge, the apical two or three about twice as long as the others which are about as long as the long hairs on the upper edge; hind femora nearly bare below. Fore tibiæ yellow with only very small bristles; middle pair blackish on basal half, more yellow on apical half, with two rather stout bristles besides those at tip; hind tibiæ black with four bristles above. Fore tarsi a little longer than their tibiæ, yellow, blackish at tip; first joint nearly as long as the remaining four taken together; last four of nearly equal length; middle tarsi yellowish brown, last joint black; hind tarsi black. Pulvilli of all tarsi small, whitish. Calypters, their cilia, and the halteres, whitish.

Wings a little grayish; costa black, veins brown; the third vein straight and close to second as far as its tip, then bent back a very little; last section of fourth vein thin, bent a little anterior to a point opposite the tip of second vein; the posterior cross vein entirely wanting.

Female: Front and face of equal width and with parallel sides, the face being a little wider than in the male and the front narrower at the vertex; fore tibiæ more brownish than in the male; wings as in the male, the posterior cross-vein wanting as in that sex.

Described from one male and four females, taken on San Francisco Island, May 30, and three females on San Lorenzo Island, May 9. This differs from our other described species in the absence of the posterior cross-vein.

Type: Male, No. 966, and *allotype*, female, No. 967, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 30, 1921, on San Francisco Island, Gulf of California.

5. *Diaphorus argentipalpis* M. C. Van Duzee, new species

Male: Length 2 mm. Face broad, silvery white; front green, dulled with thin white pollen; palpi long and narrow, nearly as long as the face, silvery white; antennæ black; third joint subquadrate, not very large; arista inserted just above the upper apical corner. Lower orbital cilia white. Thorax green with coppery reflections; dorsum dulled with thin gray pollen. Abdomen green; bristles at tip small. Hypopygium small, its central filament long.

Coxæ and femora metallic green, their tips yellow; fore and middle coxæ with delicate pale hairs; femora nearly bare below. All tibiæ yellow, nearly bare; posterior ones with small bristles. All tarsi black

from tip of first joint. Pulvilli about as long as the claws. Calypters, their cilia and the halteres whitish.

Wings nearly hyaline; first vein reaching a little more than one third the distance to tip of second; last section of fifth vein nearly twice as long as the cross-vein.

This is very much like *alienus* Van Duzee in the form of the antennæ and its small size, but in this the palpi are long and narrow and the hind tibiæ are wholly yellow as are the basitarsi, except their tips, while in *alienus* the palpi are normal but yellow and the tips of hind tibiæ and the whole of their tarsi are blackish. *D. alienus* was described from Oregon.

Type: Male, No. 968, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 19, 1921, at Loreto, Lower California.

6. *Paralius maritimus* M. C. Van Duzee, new species

Male: Length 3.8 mm., of wing 3 mm. Face rather wide, a little narrowed below, covered with white pollen, the green ground-color showing through a little on upper portion, its suture near apical fourth, lower edge straight. Front shining green or reddish coppery. Antennæ yellow; third joint brown at tip, small, about as long as wide, slightly pointed at tip; arista with long pubescence. Lateral and inferior orbital cilia whitish; about eight of the upper cilia on each side black. Dorsum of thorax green with coppery red reflections, sometimes wholly dull coppery red; the velvety black stripe above the root of the wing narrow, not conspicuous; the white spot at the suture large but not as bright as in some species; anterior portion of dorsum dulled with brownish gray pollen; pleuræ green, with white pollen. Abdomen green or coppery, with the posterior margins of the segments black, its sides with spots of white pollen, this pollen extending on to the dorsum. Hypopygium black; its lamellæ with a small basal portion yellow, with small yellow hairs; furnished with a long black flattened tapering filament; fringed with long black hairs on one edge, this filament as long as the hypopygium and quite wide at base.

Coxæ yellow, outer surface of middle pair largely black; anterior pair wholly yellow with black hairs and bristles. All femora and tibiæ wholly yellow; middle and hind femora each with one preapical bristle; middle tibiæ with two large bristles on lower edge, one at middle and one at apical fourth; posterior pair with one small bristle on lower edge. All tarsi almost wholly infuscated, only the fore tarsi and base of the first joint in the others yellowish; anterior tarsi with the last three joints of nearly equal length; hind tarsi with the first and third joints of equal length, second longer. Calypters and halteres yellow, the cilia of the former black.

Wings grayish; last section of fourth vein bent just beyond its middle, the apical portion arched, the concave side backward, its tip close to the tip of the third vein; last section of fifth vein as long as the cross-vein.

Female: Face slightly wider, with gray pollen; middle coxæ black with yellow tips, hind ones also largely infuscated; legs and feet with longer hair than in the male, especially on the upper edge of the hind femora, which are fringed above with rather long, close-set, black hair. Otherwise about as in the male.

Described from two males and six females, the latter taken at Gonzales Bay, Lower California, April 29. The males were taken at San Evaristo Ranch, June 10.

Type: Male, No. 969, and *allotype*, female, No. 970, Mus. Calif. Acad. Sci., the type collected by E. P. Van Duzee, June 10, 1921, at San Evaristo Ranch, Lower California.

7. *Paraclius hebes* M. C. Van Duzee, new species

Male: Length 2.5 to 3 mm. Face moderately wide, white, more yellowish on upper part, the suture below the middle; lower edge straight. Front nearly opaque with brownish pollen. Antennæ yellow; third joint rounded, brown at tip; arista pubescent, blunt, with a minute spine at tip. About eight of the upper orbital cilia on each side black, those below white. Dorsum of thorax bronze brown with coppery reflections, dulled with brownish pollen; the velvety black stripe above root of wing narrow; sutures on each side with moderately large round spots of white pollen. Abdomen green, with or without coppery reflections, with large spots of white pollen on the sides of the segments, this pollen extending on to the dorsum; hairs of the abdomen black. Hypopygium black; not large but of about the usual length; its lamellæ with a rather small, rounded, shining basal portion having a few minute yellow hairs at base; from these project backward along the sides of the hypopygium a long black filament which is wide at base, tapers to a point, is about half as long as the hypopygium and is fringed near the tip with long black hairs on both edges.

Fore coxæ yellow with a blackish spot at base on outer surface, its hairs and bristles black; middle and hind coxæ black with yellow tips. All femora and tibiæ yellow, the former with rather long hair on lower anterior edge; middle and hind pairs each with one preapical bristle; middle tibiæ with a large, hind ones with a small, bristle on lower anterior edge and with the usual bristles above. Fore tarsi scarcely as long as their tibiæ, yellowish, infuscated from tip of first joint which is slightly longer than the remaining four taken together; second and fifth of equal length, third shorter, fourth still shorter. Middle tarsi black from tip of first joint, hind ones blackish, the first yellow at base. Calypters and halteres yellow, the former with long black cilia.

Wings grayish; last section of fourth vein bent just beyond its middle, the apical part beyond this bend nearly straight, its tip close to tip of third vein; last section of fifth vein slightly longer than the cross-vein which is scarcely at right angles with the fourth vein; anal angle of wing rounded.

Female: Agrees with the male in color, form of tarsi and legs, venation, and in having the arista blunt at apex; the femora have some rather long hair on lower anterior edge.

Described from 10 males and 17 females, all taken by E. P. Van Duzee at Tepoca Bay, Sonora, April 25.

This is very much like the preceding species and *vicinus* Aldrich. The male and female both differ from *maritimus* in having the arista more blunt at tip, the fore coxæ with a blackish spot at base on outer side and the other coxæ darker in color. The male of *hebes* has the filament on the lamellæ only half as long as the hypopygium, while in *maritimus* it is fully as long; this latter character also separates *maritimus* from *vicinus* which likewise has the coxæ more largely black. *P. hebes* differs from *vicinus* in having the arista blunt at tip in both sexes, while the female of *vicinus* differs from the females of both the others in having the thorax and scutellum more blue or violet and much brighter.

Type: Male, No. 971, and *allotype*, female, No. 972, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 25, 1921, at Tepoca Bay, Sonora, Mexico.

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IX

**EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹**

THE GEOMETRID MOTHS

BY

W. S. WRIGHT

San Diego, California

1. *Cosymbia serrulata* Packard

San Marcos Island, June 21, one specimen. Collected by E. P. Van Duzee as were all the specimens recorded in this paper.

2. *Ptychopoda* sp.

Angeles Bay, Lower California, June 25, five specimens.

3. *Chlorochlamys* sp.

Angeles Bay, Lower California, two examples. These specimens were badly worn and discolored so the specific characters are practically obliterated. They are both females and it is only by the length of the palpi that I am able to indicate the genus.

4. *Barnesia ritaria* Grossbeck

Angeles Bay, June 25, seven males, one female.

¹A map showing the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings. Copies of which can be supplied at nominal cost.

June 7, 1923

5. *Perizoma polygrammata* Hulst ?

Angeles Bay, June 25, 27, four specimens. *Perizoma cus-todiata*, *polygrammata* and *cornata*, as identified by the late John A. Grossbeck, all fly at the same time and in the same locality. In my own collection they intergrade to such an extent that it is difficult to disassociate them. I am not sure that I know either species definitely. These four specimens agree best with what I have in my own collection under the name *polygrammata* Hulst, identified for me by Mr. Grossbeck himself. *Perizoma epictata* Barnes & McDonough, evidently belongs to this same group and though I have collected it in San Diego, California, for many years, I am not sure that I have the species. The Angeles Bay specimens belong to one of the four species and appear to be *polygrammata*, hence the reference.

6. *Glaucina puellaria* Dyar

Agua Grande, Carmen Island, June 15, one specimen.

7. *Glaucina eupetheciaria* Grote

Angeles Bay, June 25, three specimens.

8. *Glaucina abdominalis* Grossbeck ?

Angeles Bay, May 4, June 25, one male, four females. These specimens appear to be *abdominalis* but may prove to be a new species. The only male in the group is too badly worn to make sure identification possible.

9. *Fernaldella fimetaria angelata* Wright, forma nova.

Four specimens form this group, two from Guaymas, Sonora, and two from Angeles Bay, Lower California. When compared with specimens of *fimetaria* they are somewhat larger and the light markings above the costal area of the primaries are broader and the darkened area is less contrasting than in *fimetaria*. On the secondaries the silvered areas are larger and show less tendency to break up into spots. On both wings the marginal row of silvered spots are dart-like

in form and extend clear to the outer edge of the fringes, being much longer and narrower than in *finetaria*.

Type: Male, No. 973, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 30, 1921, at **Angeles Bay, Lower California**.

Allotype: Female, No. 974, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 7, at Guaymas.

Paratypes: One male from Guaymas and one male from Angeles Bay, June 25.

10. *Phasiane colorata* Grote

Angeles Bay, June 25, two specimens.

11. *Phasiane s-signata ballandrata* Wright, forma nova.

This form differs from the parent species in the intensity of the color and the course of the cross lines. In *s-signata* the lines are narrow, the inner line often reduced to a mere suggestion, while in *ballandrata* the line is heavy and very broad, curving distinctly outwards in the median portion, no attending shades. The outer line in *ballandrata* is broader and more contrasting, also the curves are more pronounced and the general course of the line is more oblique than in *s-signata*. In all other particulars the specimens agree with Packard's species.

Type: Male, No. 975, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 20, 1921, at **Loreto, Lower California**.

Allotype: Female, No. 976, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 21, 1921, at Puerto Ballandra, Carmen Island.

Paratype: Female, Loreto, May 20.

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X

**EXPEDITION OF THE CALIFORNIA ACADEMY
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CALIFORNIA IN 1921¹**

THE TINEID MOTHS

BY
ANNETTE F. BRAUN
Cincinnati, Ohio

GELECHIIDÆ

1. *Aristotelia howardi* Walsingham

Walsingham, Biol. Centr. Amer., Vol. 4, p. 23, 1909; Pl. I, fig. 21.

Two specimens, one male, one female, Angeles Bay, Lower California, June 25, 1921, collected by E. P. Van Duzee, as were all the specimens listed in this paper.

2. *Aristotelia pulvera* Braun, new species

Palpi whitish, two narrow pale brown annuli on second segment, tip of second segment pink, third segment with an indistinct brown annulus at base, middle and tip respectively. Antennæ brown. Head pale ochreous anteriorly, pink above posteriorly. Fore wings whitish ochreous, evenly dusted with fine brown atoms, and rosy tinged along the fold and in the apical third of the wing. An oblique brown bar from basal third of costa nearly to dorsum, broadest on the fold; a quadrate brown patch at apical third of costa, and beneath it on the middle of the wing a nearly circular golden brown and rosy tinged spot. Legs whitish, with brown bars, the pale spaces more or less deeply tinged with pink. Expanse 13.5 mm.

¹A map showing the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings. Copies of which can be supplied at nominal cost.

June 7, 1923

Type: Male, No. 977, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 4, 1921, at Angeles Bay, Lower California.

3. *Telphusa nigrimaculata* Braun, new species

Palpi dull ochereous, dusted with fuscous; antennæ annulate with fuscous. Head and thorax dull ochereous with fuscous dusting densest on the patagia and median line. Fore wings dull ochereous with fuscous dusting and small aggregates of raised black scales forming ill-defined markings. An oblique line of minute black spots forms the inner border of an almost undusted bar which extends from basal fifth of costa to the fold; beyond this paler area, in the dusted middle portion of the wing, are several small patches of black scales; near the end of the fold is a minute patch of raised black scales; and above the end of the fold a larger patch of raised scales; an elongated patch of denser dusting on the middle of the costal margin; around apex the dusting is arranged in spots separated by the undusted ground color. Hind wings brownish ochereous. Legs whitish, dusted with fuscous. Abdomen brownish, basal two segments yellow. Expanse 12 mm.

Type: Female, No. 978, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 14, 1921, at Escondido Bay, Lower California.

4. *Gnorimoschema triocellella* Chambers

Chambers, Bull. Geol. Surv. Terr., III, p. 127, 1877.

One specimen, Angeles Bay, June 25, 1921. There is more white in the scales than is usual in this species and the ocellate spots lack the brown center, being entirely ochereous.

5. *Anacampsis triangularis* Braun, new species

Palpi whitish, with a few scattered brownish scales, base of second segment dark brown. Antennæ ochereous, with brown annulations, and first two or three segments brown. Head, thorax and fore wings dull ochereous, the ground-color of the fore wings gradually deepening toward apex to a reddish ochereous color in the apical third. There is a sparse sprinkling of dark brown scales over the wing surface and in the paler cilia. Markings dark brown; extreme base of costa dark brown; an elongate spot near middle of costa and a larger triangular spot at apical third of costa reaching one-fourth across the wing; a small spot beyond middle of cell and a little anterior to it in the fold a similar spot; an irregular transverse brown line at end of cell and just above end of fold a spot somewhat larger than the discal spot; slight aggregates of brown scales in the interspaces around the apex. Hind wings brownish gray, darker than the fore wings. Legs whitish with scattered brown scales; anterior tarsi dark brown with pale tips. Expanse 14 mm.

Type: Female, No. 979, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 4, 1921, at Angeles Bay, Lower California.

6. *Gelechia sistrella* Busck

Busck, Proc. U. S. N. M., XXV, p. 862, 1903.

One specimen, Angeles Bay, Lower California, June 25, 1921.

7. *Gelechia inæqualis* Walsingham

Walsingham, Biol. Centr. Amer., Vol. 4, p. 66, 1911.

Six specimens, Angeles Bay, Lower California, June 25, 1921.

In five of the six specimens the outer two-thirds of the fore wing is more or less suffused with pink and blotched with golden brown; in the original description the ground color is described as "brownish white, dusted with brownish fuscous."

8. *Gelechia albipectus* Walsingham

Walsingham, Biol. Centr. Amer., Vol. 4, p. 63, 1911.

Five specimens, Angeles Bay, Lower California, June 25 and 26, 1921.

This is an obscurely marked species, best recognized by the white undersurface of the body, sharply contrasting with the velvety black palpi and sides of thorax, and the black dashes along the sides of the abdomen.

9. *Gelechia elaboratella* Braun, new species

Palpi white faintly tinged with ochereous, and usually dusted with blackish specks; base of second segment sometimes blackish; a faint annulus near base of third segment. Antennæ fuscous with whitish annulations. Head, thorax and fore wings white shaded with pale ochereous, and more or less dusted with fuscous. Markings of the fore wings blackish or brownish fuscous; at basal fifth a pale brown patch, outwardly limited by blackish scales, not reaching either margin, and fading into the ground-color toward base; one or two spots on costa near base; an obliquely placed oval patch in the middle of the wing at the basal third, margined along the fold by dark brown scales, and con-

nected with basal fourth of costa by a narrow patch of similar dark scales; just beyond a small black discal spot; at end of cell an oblique curved brown streak, concave inwardly and beneath; beyond this the ground color shades to pale brownish, dusted with fuscous; at two-thirds the wing length curved, very oblique, whitish costal and dorsal streaks meet in an acute angle in the apical part of the wing; a series of minute black spots around apex. Cilia white, speckled with fuscous. Legs whitish, dusted; tarsal segments blackish with pale tips. Expanse 14 mm.

Type: Male, No. 980, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 25, 1921, at **Angeles Bay, Lower California**. *Paratype*, April 23, 1921, Freshwater Bay, Tiburon Island, Gulf of California.

There is considerable difference in the depth and density of dusting on the wing of these two specimens.

10. *Gelechia intermedia* Braun, new species

Palpi whitish, speckled with black, tuft triangular, due to the unusual length of the scales of its basal half. Antennæ whitish, with fuscous annulations. Thorax and fore wings clothed with whitish scales which over most of the wing area are very narrowly tipped with blackish; some aggregates of scales are more broadly black-tipped, forming scarcely defined darker patches, situated as follows: a patch along extreme base of costa, near middle of costa and at two-thirds of costa; a small patch in cell near base, a larger diffuse scarcely defined patch beyond it, and another near end of cell. Apex of wing dusted with more deeply black-tipped scales. Hind wings and cilia brownish, darker toward margins. Legs white, dusted with brownish fuscous. Expanse 17 mm.

Type: Female, No. 981, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 25, 1921, at **Angeles Bay, Lower California**.

11. *Dichomeris mexicana* Walsingham

Walsingham, Biol. Centr. Amer., Vol. 4, p. 96, 1911.

One specimen, Angeles Bay, Lower California, May 4, 1921.

BLASTOBASIDÆ

12. *Holocera* sp.

One specimen, Espiritu Santo Island, Gulf of California, May 31, 1921.

SCYTHRIDÆ

13. *Scythris divaricata* Braun, new species

Palpi white, dusted with black, apex of second and extreme tip of third segment white. Head and basal segment of antennæ clothed with black and white scales; antennal pecten white. Fore wing white with the ground-color, except in the costal third of the wing, more or less obscured by black dusting. In the basal half of the dorsal two-thirds of the wing this dusting is dense and evenly distributed; at basal fifth just above the dorsal margin is a black spot, not always distinctly defined; lying obliquely across the fold at one-third is an irregular rectangular white patch, its costal end nearer base; at end of cell a rather conspicuous black spot. The line of demarcation between the dorsal dark area and the relatively undusted costal third of the wing is rather sharply defined; three or four longitudinal lines of dusting may be distinguished in the costal area, the first from the base to one-third of costa, the others from the cell to the margin in the apical third of the wing. Costal cilia white, dorsal cilia brownish ochereous. Hind wings pale grayish brown, cilia brownish ochereous. Legs white, dusted with black. Expanse 14 to 17 mm.

Type: Male, No. 982, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 4, 1921, at **Angeles Bay, Lower California**; two *paratypes*, same place, May 4 and June 25, 1921.

This species is allied to *Scythris sponsella* Busk, with which it agrees in all structural characters.

TINEIDÆ

14. *Myrmecozela erecta* Braun, new species

Labial palpi pale ochereous, second segment with dense brush, dark brown on outer side, and spreading lateral setæ, third segment flattened, a conspicuous dark brown spot on its under side. Head, thorax and fore wings pale dull ochereous; the fore wings with transverse broken brown strigule, and several conspicuous brown markings of which the following stand out clearly: At one-third of costa an elongate spot; in middle of fold a round spot; at two-thirds a Y-shaped mark, the ends of the arms on costa, the leg across the end of the cell; near apex on costa a small triangular spot. Hind wings and cilia pale brownish ochereous, a little darker than the fore wings. Legs pale ochereous, fore legs shaded with brown. Expanse 12 mm.

Type: Male, No. 983, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 25, 1921, at **Angeles Bay, Lower California**.

ACROLOPHIDÆ

15. *Acrolophus* sp.

One specimen, Angeles Bay, Lower California, June 25, 1921.

16. *Acrolophus* sp.

One specimen, Angeles Bay, Lower California, May 4, 1921.

17. *Acrolophus* sp.

One specimen, Angeles Bay, Lower California, May 4, 1921.

18. *Acrolophus* sp.

One specimen, San Carlos Bay, Sonora, Mexico, July 9, 1921.

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XI

**EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹**

THE HEMIPTERA (True Bugs, etc.)

BY

EDWARD P. VAN DUZEE

Curator, Department of Entomology

In this paper are recorded all the Hemiptera, excepting the Coccidæ, taken by the 1921 expedition of the California Academy of Sciences to the islands of the Gulf of California. Two hundred and forty-six species and subspecies are here enumerated, of which 75 are described as new and five new genera are established. For further details regarding the localities mentioned and for the itinerary of the expedition the reader is referred to the account of the expedition by Mr. Joseph R. Slevin which precedes these papers.

Attention should be called to the fact that this work was done at the end of the dry season when insect life was at its lowest ebb, and the only Hemiptera obtainable were such individuals as had survived the vicissitudes of the dry season and the depredations of predacious birds and insects. The summer rains were just beginning as we approached Guaymas on the return home, and new forms were coming out in great numbers during our last two days' work at San Pedro Bay

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings. Copies of which can be supplied at nominal cost.

June 7, 1923

and San Carlos Bay, near Guaymas. Unless otherwise stated all insects recorded in this and other papers on the entomological results of this expedition were collected by myself.

1. *Pachycoris torridus* Scopoli

San Pedro Bay, Sonora. Found in great numbers on *Croton californica*. Most of these were mature but on a few plants a considerable percentage were still in the nymph stage. This series is very uniform, being about 12 mm. in length, of a polished blue-black color, with the 22 red spots found in the typical form as figured by Distant in the *Biologia*, Pl. 1, fig. 1. When teneral, these insects are of a bronze-brown, or even of a reddish, ground color.

2. *Camirus consocius* Uhler

Guaymas, April 11, one dead individual found under a stone in Guaymas Valley four miles north of the city. I can best distinguish this species by the carinate margin of the head which is nearly straight and becomes evanescent posteriorly, while in *porosus* it is percurrent and abruptly angled before the eye. This specimen wants the pale marks found in Arizona material, as do those of a series from Rio Balsas Gros, Mexico, received from Prof. H. F. Wickham.

3. *Sphærocoris punctellus* Stål

Taken on Ceralbo Island in great numbers on wild cotton. A few young were taken with the adults but most were mature. These show the same variation in markings as does *obliquus* but may be distinguished from that species by the shorter and more rounded head. A few were taken on the same plant at Puerto Ballandra, Carmen Island, May 22, but there most were immature. One from Carmen Island has the scutellum paler with a transverse spot across the base and two large contiguous, nearly round, spots on the posterior slope deep black, nearly as figured by Distant for *Homæmus proteus* on Pl. 2, fig. 4, of the *Biologia*. A similarly marked but paler individual is among the material from Ceralbo.

4. *Corimelæna cognata* Van Duzee

Agua Verde, May 26, taken in great numbers from plants of *Eucnide cordata* Kell. which had not yet become completely dry. Also taken in fewer numbers at San Carlos Bay, Sonora, Mulegé and La Paz on the peninsula and on the following islands: Angel de la Guardia (Pond Island Bay, June 30); San Lorenzo, May 9; San Francisco, May 30; and Espiritu Santo, May 31. I described this species from material taken at Kingston, Jamaica, in 1906. These specimens agree in every particular with the types now in my collection. It may be distinguished from *pulicarius* by the narrower head, stronger puncturation, oblique osteolar canal, usually pale apical margin of the scutellum and in having the inferior surface of the pronotal margins more strongly punctured and flatter, not deeply impressed.

5. *Æthus testudinatus* Uhler

Guaymas, April 7, one example.

6. *Æthus conformis* Uhler

Two females, Angeles Bay, May 5, Espiritu Santo, June 9. These agree in every particular with Uhler's description, but have the apex of the scutellum much broader and the puncturation different from Signoret's figure which probably represents a distinct species. One dead and mutilated male, evidently of this species, was taken under a stone at Guaymas, April 10.

6a. *Geotomus noctivagus* Van Duzee, new species

Black; longer and more parallel-sided than *parvulus*, but almost similarly punctured; length over twice the greatest width; head almost devoid of setæ. Length 3.3 to 3.7 mm.

Elongate, parallel-sided. Head shorter than in *parvulus*, regularly arcuated from the eyes; anterior margin slenderly reflexed, devoid of setæ; inferior setæ short; superior surface minutely, obscurely, punctured, leaving the basal area widely smooth and armed with the usual four erect setæ only, the posterior pair short; clypeal suture obscure, becoming obsolete posteriorly. Sides of pronotum parallel to beyond the middle; moderately arcuated anteriorly, slenderly reflexed, the mar-

ginal setæ very short; surface coarsely, shallowly, punctate, with a large vague smooth area either side, extended anteriorly so they nearly connect on the median line. Scutellum elongated, nearly flat, with a marginal row of close fine punctures, the disk coarsely shallowly punctured. Elytra more deeply punctured except on corium posteriorly; membrane white. Antennæ piceous brown, pale apically; segments II to III subequal, IV and V successively longer. Rostrum attaining middle of mesosternum; mesosternum opaque and slenderly carinate along the middle. Osteolar canal extended obliquely but becoming evanescent before attaining the anterior angle of the opaque area; lower surface obscurely punctured on sides of venter and anterior area of propleuræ. Legs black; tarsi pale.

Described from two examples taken at night on board ship in San Carlos Bay, July 8, whence they had flown from the shore, a half mile distant, attracted by the lights of the ship. This species apparently is allied to *crenatus* Signoret, but the head is shorter, the puncturation is coarser and more irregular, the smooth areas of the pronotum more extended and the form of the osteolar canal different.

Type: Male, No. 984, Mus. Calif. Acad. Sci., collected July 8, 1921, at San Carlos Bay, Sonora.

7. *Platycarenum* sp.

Nearly mature young of a species of this genus, probably *clypeata*, were found abundantly on Palo San Juan at San Pedro Bay, July 7. Material taken at Guaymas, April 7, was scarcely half grown.

8. *Brochymena tenebrosa* Walker

Taken at most all stations on mesquite and allied bushes and trees, *Laccodesmia* and palo blanco, Guaymas, April 7 to 9; San Esteban, April 20; Puerto Ballandra, Carmen Island, May 22; Agua Verde, May 26; San José Island, May 28, 29; Salinas Bay, Carmen Island, June 16; Tiburon Island, south end, July 4, 5. Some individuals have four or five teeth on latero-anterior margins of pronotum in place of the usual three.

9. *Brochymena apiculata* Van Duzee, new species

Allied to *aculeata* Dist., but with a shorter head, armed with an acute spine on the margin before the eye, and a much shorter scutellum but little elevated at base. Length 11 mm.

Male: Head slightly broader at base of antecular spine than long before the eyes; sides nearly parallel, armed before the eye with a sharp spine as long as apical width of tylus; subapical tooth as prominent as in *hædula* but placed further forward; lateral lobes scarcely surpassing the tylus. Pronotum more even than in *hædula* or *aculeata*; latero-anterior margins armed with about five long acute teeth, about as in *aculeata*, the humeral angles narrower with shorter teeth than in that species; anterior lobe with distinct median smooth line, the posterior coarsely nigro-punctate but not rugose. Scutellum scarcely longer than its basal width, sides very feebly excavated, apex rounded; base convex but not tumid, continued as a feeble median carina to apical fourth. Surface nearly smooth, nigro-punctate, the basal punctures arranged in about three vittæ either side of the middle. Elytral surface even, nigro-punctate, the punctures forming an obscure transverse vitta near the middle and another toward the apex, each indicated on the scutellar margin. Membrane and connexivum as in *hædula*. Anterior tibiæ but slightly expanded, about as in *aculeata*. Antennæ more slender than in either allied species, black with narrow pale base to each segment; II a sixth shorter than III. Venter pale testaceous, impunctate, wanting the black lateral vittæ found in allied species. Rostrum attaining middle of third segment of venter. Genital segment similar to that of *hædula* but the protruding claspers narrower and more acute.

Described from one male taken at San Pedro Bay, July 7. This species has a more even surface than *arborea* or either species with which it is compared and from any of which species it may be distinguished by the sharp spine before the eye.

Type: Male, No. 985, Mus. Calif. Acad. Sci., collected July 7, 1921, at San Pedro Bay, Sonora, Mexico.

10. *Chlorochroa sayi* Stål

Las Animas Bay, May 8, two examples.

11. *Thyanta perditor* Fabricius

Angeles Bay, June 26. Six specimens were taken from a bush of *Frankenia palmeri* on which they evidently had bred.

12. *Thyanta casta* Stål

Angeles Bay, May 4; Escondido Bay, May 24; Puerto Ballandra, Carmen Island, May 21; Espiritu Santo Island, June 1. One example was taken at each locality. These agree in all characters and answer perfectly to Stål's description. They are smaller and less convex than appears to

have been the case with the specimen figured by Distant in the *Biologia*.

13. *Thyanta brevis* Van Duzee

Escondido Bay, June 14; Guadalupe Point, Concepcion Bay, June 17; Agua Verde, May 26; San Francisquito Bay, May 10. The individual from San Francisquito Bay is dark fuscous varied with pale but does not differ structurally. Such variation in color is common in all related species.

14. *Thyanta panda* Van Duzee, new species

Closely allied to *rugulosa* and *punctiventris*, differing by the shorter scutellum and longer osteolar canal. Length 6-8 mm.

Head as in *punctiventris*, deeply sinuated before the eyes, then parallel to the rounded apex. Segment III of antennæ three-fifths the length of II and subequal to IV. Pronotum one-third as long as wide, a little shorter than the head; carinate sides slightly sinuated, broadly produced below the subtuberculate humeri much as in *punctiventris*. Scutellum a little broader than long, sides nearly straight, apex rounded. Rostrum attaining hind coxæ. Osteolar canal broad at base, shallow, regularly tapering to an acute apex where it becomes almost merged with the surface of the pectus. Genital segment trisinate, the claspers similar in shape to those of *rugulosa* but with the transverse apical member narrower, the exterior branch curved and blunt, not acute as in *rugulosa*. Punctuation of upper surface close and fine, much as in *brevis*.

Color clear green, yellowish on head, margins of pronotum and scutellum, almost uniform in life; beneath paler and tinged with yellow; mesosternum usually with a fuscous or black vitta either side; antennæ infuscated at apex; tibiae and tarsi more or less blackish; membrane sometimes dotted. Some individuals are testaceous brown; nigro-punctate, these punctures forming a median vitta on the head and some irregular spots on pronotum and scutellum.

Described from five males and 10 females taken from *Heliotropium curassavicum* Linn., growing near the sea shore at Loreto, May 20. They were present in great numbers and both brown and green males were pairing with the green females.

Type: Male, No. 986, and *allotype*, female, No. 987, Mus. Calif. Acad. Sci., collected May 20, 1921, at Loreto, Lower California.

15. *Thyanta jugosa* Van Duzee, new species

Allied to *panda* but with greatly produced osteolar canal, a transverse ridge covering the callosities and a longer scutellum with a tumidly raised base. Length 6-7 mm.

Head longer and narrower at apex than in *panda*, narrower than in *rugulosa*; cheeks almost pointed at apex, slightly exceeding the tylus, their inner margins slightly sinuate, strongly sinuated exteriorly above the antennæ. Segment III of antennæ perceptibly shorter than II. Pronotum with a transverse raised area covering and connecting the callosities; sides still more strongly reflexed than in *rugulosa*. Scutellum slightly shorter than in *rugulosa*, longer than in *panda*; base elevated, with a strong transverse depression behind it, apex slightly reflexed, subangular. Dorsal surface roughly punctured. Osteolar canal very long and narrow, a little contracted near the middle. Male claspers short-triangular at apex, the sides nearly straight and apex fringed with soft hairs.

Color, green to testaceous brown, more or less varied with yellowish and fusco-punctate, at least in the darker examples, marked with a black point at inner angle of each callosity; connexivum with geminate fuscous or black spots at the incisures; membrane frequently sparsely dotted; beneath and legs pale with darker dots and punctures; meso-sternal carina usually fuscous; ventral segments mostly with a row of fuscous points; femoral punctures forming an incomplete annulus at apical third; antennæ pale, impunctate, a little dusky at apex.

Described from five male and 12 female examples taken on Isla Raza, April 21. Other specimens that do not seem to differ specifically were taken as follows: Santa Inez Island, May 13; Isla Partida, April 22; Mejia Island, April 30; Angeles Bay, June 25, 26; Coyote Bay, Concepcion Bay, June 18; Ceralbo Island, June 8; San Carlos Bay, July 9; San Lorenzo Island, May 9; San Francisco Island, May 30. So far as recorded all were taken on *Atriplex barclayana*.

Type: Male, No. 988, and *allotype*, female, No. 989, Mus. Calif. Acad. Sci., collected April 21, 1921, at Isla Raza, Gulf of California.

16. *Murgantia munda* Stål

San Pedro Bay, July 7. Taken with young on Palo San Juan.

PYLOPHORA Van Duzee, new genus

Allied most closely to *Bagrada* Stål, and pertaining to the division *Strachiaria* Stål (1872); oblong or somewhat ovate.

Head bluntly triangular, moderately declinate and arcuate in both diameters. Cheeks shorter than the tylus, scarcely approaching at apex; margins subsinuate and strongly reflexed; surface transversely rugose; vertex polished; eyes short-stylate; ocelli three times more distant from one another than from the eyes; bucculae scarcely elevated. Antennae as long as basal width of pronotum; segment I not reaching apex of head; II and III subequal. Rostrum attaining base of abdomen; mesosternum carinate. Pronotum, lateral margins reflexed, anterior scarcely calloused; surface punctured; callosities a sinuate polished line only. Scutellum nearly equilateral; frenum passing the middle; membrane with a few heavy veins; osteolar orifice very small, a mere opening between the intermediate and posterior acetabulae, without a canal or exterior development of any kind, perhaps not functional. Venter impunctate or nearly so, without median sulcus; segment II simple. Tibiae sulcate; segment I of hind tarsi thickened; nearly as long as II and III together.

Type of genus, *Pylophora insularis* Van Duzee, n. sp.

17. *Pylophora insularis* Van Duzee, new species

Yellowish testaceous, coarsely sparsely nigro-punctate; membrane with six heavy simple nervures. Length 5 mm.

Male: Head impunctate, polished; inner margin of cheeks sinuated, not approaching at apex. Segment I of antennae not attaining apex of cheeks; II and III subequal; IV longer than V. Pronotum short, flat, its length three-eighths its width; anterior and posterior margins parallel, the former without a collum, sides feebly sinuate; surface polished, with a very few large fuscous punctures, mostly in a line across the middle; callosities dark brown, sinuate. Scutellum narrow and rounded at apex, with a few large punctures. Elytra short and broad; costa expanded, surface coarsely but rather closely punctate; pectus with a few coarse, nearly obsolete punctures. Genital segment armed with two rounded hairy lobes either side; claspers slender, very acute and curved outward.

Color, pale yellowish testaceous, fusco-punctate, a little deeper on the head, scutellum and venter; antennae fuscous, the segments very narrowly pale at base; I pale with a black subapical annulus; membrane pale fuliginous, veins heavy, fuscous; legs whitish, sparsely varied with fuscous; venter fusco-testaceous, the sutures and stigmatal slits fuscous.

Described from one male taken with immature individuals on *Atamisquaca emarginata* on San Esteban Island, April 19.

Type: Male, No. 990, Mus. Calif. Acad. Sci., collected April 19, 1921, at San Esteban Island, Gulf of California.

18. *Pylophora punctata* Van Duzee, new species

Larger than *insularis*; closely, coarsely punctured; male claspers converging. Length 7 mm.

Male: Head about as in *insularis*, the inner line of cheeks slightly converging anteriorly; base of vertex very obscurely punctate. Segment II of antennæ decidedly shorter than III; pronotum, scutellum and elytra coarsely and closely punctured, apex of scutellum nearly impunctate; membrane with seven or eight strong nervures. Claspers converging and very acute.

Color as in *insularis* but appearing darker from the more numerous punctures; recurved margins of head and the antennæ often touched with metallic green; median line and sides of pronotum and the connexivum usually lemon-yellow. Sides of head and disk of venter marked with orange in some individuals. Female similar to male but often paler.

Described from seven male and nine female examples taken from Palo San Juan at Guadalupe Point, Concepcion Bay, June 17. A series of two males and three females were taken on *Atamisquaca emarginata* on Coronodos Island, May 18, which differ only in being smaller, in having the inner margins of the cheeks parallel, and in having the yellow markings deepened to orange.

Type: Male, No. 991, and *allotype*, female, No. 992, Mus. Calif. Acad. Sci., collected June 17, 1921, at Guadalupe Point, Concepcion Bay, Lower California.

19. *Dendrocoris contaminatus* Uhler

San Marcos Island, June 19; Guadalupe Point, Concepcion Bay, June 17. Here as elsewhere on creosote bush.

20. *Acanthocephala granulosa* Dallas

San Carlos Bay, Sonora, July 9, one example.

21. *Leptoglossus phyllopus* Linnæus

Guaymas, April 11, one example.

22. *Leptoglossus zonatus* Dallas

Angeles Bay, June 27; San José Island, June 10, one immature example.

23. *Narnia inornata* Distant

Guaymas, April 7, 13; Marquer Bay, Carmen Island, May 23, one example.

24. *Thasus gigas* Burmeister

Larvæ, evidently of this species, were found clustered on leaves of mesquite at La Paz, June 3.

25. *Mozena hector* Van Duzee, new species

Form and color much as in *Acanthocephala terminalis*, but larger with the humeral angles more prominent and the disk between them more convex; fuscous-brown, last three antennal segments and tarsi fulvous. Length 26 mm.; humeral width 9 mm.

Male: Head larger than in *lineolata*; segment I of antennæ distinctly longer than II, III scarcely longer than IV. Pronotum with humeral angles much less prominent than in *lineolata*, obtusely right-angled at apex, their anterior margins smooth, feebly arcuate; sides on anterior two-thirds nearly rectilinear, minutely denticulate on anterior one-third; disk moderately convex, finely punctured between vermiculate smooth lines; subbasal ridge as in *lineolata*. Rostrum attaining apex of anterior trochanters. Scutellum sparsely punctate, leaving the sides and much of the apical field smooth, the apex pale; margins of abdomen armed with sharp teeth as in *lineolata*. Beneath, mostly smooth, punctate on the propleura and about the coxæ; a few impressed spots on either side of venter in line with the stigmata. Femora much thickened with the usual double row of tubercles above and below; about two on inner line beneath larger; coxæ with a thick elbowed spine exteriorly, the trochanters with a stout blunt spine interiorly and an acute black apex below; tibiæ expanded and bent as in allied species with two large teeth and several smaller ones on apical half.

Color, fuscous brown; humeral angles, membrane and most of connexivum black. Segment I of antennæ, femora and hind tibiæ piceous; segments II to IV of antennæ and tarsi fulvous, the anterior and intermediate tibiæ darker. Beneath snuff brown with three large yellowish areas on either side of pectus.

Described from one male taken on mesquite at southern end of Tiburon Island. Both in color and form this insect recalls *Acanthocephala* but the generic characters are all those of *Mozena*.

Type: Male, No. 993, Mus. Calif. Acad. Sci., collected July 4, 1921, on southern end of Tiburon Island, Gulf of California.

26. *Mozena lineolata* Herrich-Schæffer

Not uncommon on mesquite; Puerto Ballandra, Carmen Island, May 22; Agua Verde, May 26; La Paz, June 4; Tiburon Island, July 4; San Pedro Bay, Sonora, July 7; Dan-

zante Island, June 15. Found resting on *Atriplex* bushes at Angeles Bay, May 5 to 7.

27. *Mozena rufula* Van Duzee, new species

Form nearly of *brunnicornis*, shorter with abdomen more depressed than in *lunata*; of an almost uniform ferruginous red. Length 19 mm.

Female: Head with a prominent pale tubercle next to the inner hind angle of the eye and an irregular smooth area before each ocellus. Pronotum sublunate; hind margin of humeri arcuate, finely serrate, their anterior margins rectilinear, their subspinose apex directed outward, the margins anteriorly with pale irregular nodules; surface closely, rugosely punctate, the region of the callosities nearly smooth. Corium sparsely, irregularly punctured. Hind femora with a double row of about eight stout teeth on apical half beneath and a double row of small tubercles above; tibiae slightly expanded within, with a row of small teeth, two of which are larger. Basal segment of antennæ a third longer than II; III and IV subequal. Rostrum attaining rear line of anterior coxæ.

Color, nearly uniform ferruginous red; hind edge of humeri and posterior tibiae blackish; clavus and inner apical field of corium whitish, the hind margins of the latter calloused and ivory white; a punctured whitish calloused area on the latero-posterior angles of the metapleura, sending a branch forward to above the osteolar orifice; membrane pale fuliginous.

Described from two females taken at San Pedro Bay, Sonora.

Type: Female, No. 994, Mus. Calif. Acad. Sci., collected July 7, 1921, at San Pedro Bay, Sonora, Mexico.

28. *Chariesterus cuspidatus* Distant

San Carlos Bay, Sonora, July 9, one example.

29. *Chelinidia tabulata* Burmeister

San Lorenzo Island, June 24, two examples taken on cholla cactus.

30. *Scolopocerus secundarius* Uhler

Concepcion Bay, June 18, one specimen taken at Coyote Cove by J. C. Chamberlin; Guaymas, April 13.

31. *Catorhintha guttula* Fabricius

Escondido Bay, May 24, June 14; San Marcos Island, June 19, J. C. Chamberlin, three examples.

32. *Catorhintha selector* Stål

Guaymas, April 11, three examples.

33. *Hyalymenus subinermis* Van Duzee, new species

Closely allied to *tarsatus* but readily distinguished by the obtuse humeral angles, the presence of a transverse vitta on the fourth ventral segment and by the characters of the hind legs and male genitalia. Length 14 mm.

Vertex transversely more convex than in *tarsatus*. Segment IV of antennæ about twice as long as I, in *tarsatus* distinctly still longer; humeral angles subacute, not prolonged in a spine; post-humeral tooth fully half as prominent as humeral; teeth on segments IV and VI of connexivum longer than those on III and V, both less spinose than in *tarsatus*. Hind femora with a single or double large tooth below, anterior to middle (sometimes wanting), and a broad plate-like keel before the apex, and between these a single small tubercle above and below, placed nearer the plate; apex of this plate grooved to receive the tibial plate, armed with a double row of small black tubercles, about two above and four below; before the apex of the femora a larger tooth with from one to three smaller ones. Hind tibiæ formed as in *tarsatus* but less abruptly expanded near base and apex, similarly crenate at middle. Rostrum attaining hind margin of intermediate coxæ. Sternum impunctate, medially clothed with short silvery white hairs, the metasternum not distinctly elevated as in *tarsatus*; osteolar canal thickened and curved anteriorly toward its obtuse apex; pectus with a broad, nearly smooth vitta, exterior to the coxæ, from base of rostrum to apical angle of metapleura, narrowly broken by the punctured base of each pleural area. In *tarsatus* this vitta is broadly broken by the punctured areas. Disk of venter smooth, ivory white, bordered by castaneous vittæ which broadly coalesce on base and apex of sixth segment, leaving a large oval subelliptical spot. Ventral genital plate strongly produced in a rounded lobe (broadly arcuated in *tarsatus*), clothed with rather long pale hairs; claspers flattish, their inner margins parallel and contiguous for nearly half their length to an oblong notch, the apical angle of which is emphasized by an almost tooth-like angle. In *tarsatus* these claspers are narrower, more convex, converging toward apex with but a feeble open notch within. Color as in pale forms of *tarsatus*, and probably similarly variable; tergum red.

Described from six males, four taken at Guaymas, April 10 and 11, one from San Carlos Bay, Sonora, July 8, and

one from San Nicolas Bay, Lower California, May 17. A larva, taken at Escondido Bay, evidently belongs here.

Type: Male, No. 995, Mus. Calif. Acad. Sci., collected April 11, 1921, at Guaymas, Sonora, Mexico.

34. *Harmostes angustatus* Van Duzee

Puerto Refugio, Angel de la Guardia Island, May 1, on *Hymenoclea*; Mejia Island, April 30; San Esteban Island, April 19; San Francisquito Bay, May 10; San Francisco Island, May 30, on *Parosela emoryi*.

35. *Harmostes croceus* Gibson

Agua Grande, Carmen Island, June 15, one example.

36. *Aufius impressicollis* Stål

San Marcos Island, June 19, one example.

37. *Corizus hyalinus* Fabricius

Guaymas, April 11; Angeles Bay, June 27; Pond Island Bay, Angel de la Guardia Island, July 1.

38. *Corizus sidæ* Fabricius

Mulegé, May 15; Guaymas, April 11.

39. *Corizus sidæ pictipes* Stål

Mulegé, May 15, one example.

40. *Corizus lateralis* Say

Guaymas, April 11; San Pedro Martir Island, April 18; Puerto Refugio, Angel de la Guardia Island, May 1, on *Eriogonum*.

41. *Corizus punctatus* Signoret

Angeles Bay, June 26, 27. Close to *C. validus* Uhler but differing in form of male claspers.

42. *Corizus parvicornis* Signoret

Guaymas, April 11, two examples.

43. *Jadera hæmatoloma* Herrich-Schæffer

Guaymas, April 13; Puerto Ballandra, Carmen Island, May 22; Coronados Island, May 18; Bay at south end of Tiburon Island, July 5.

44. *Jalysus perclavatus* Van Duzee

Mulegé, May 15, one pair; Tortuga Island, May 11, one young.

45. *Pronotacantha annulata* Uhler

Ildefonso Island, May 17, J. C. Chamberlin, two examples.

46. *Acanthophysa echinata* Uhler

San Lorenzo Island, May 9, I. M. Johnson, four examples. On *Passifolia*.

47. *Oncopeltus sanguinolentus* Van Duzee

Guaymas, April 6 to 15; San Pedro Bay, Sonora, July 7; Mulegé, May 14; Puerto Refugio, Angel de la Guardia Island, June 29; San Marcos Island, May 12; Puerto Ballandra, Carmen Island, May 22; Pond Island Bay, Angel de la Guardia Island, June 30; La Paz, June 3. Abundant everywhere on milkweeds. The extent of the black markings varies greatly as does the size and the dimensions of the membranal white spot.

48. *Oncopeltus gutta* Herrich-Schæffer

Mulegé, May 15, on purple milkweed; Guaymas, April 10 to 13, on red milkweed. All these specimens have the yellow on the pronotum in two oval spots as in *6-maculatus*.

49. *Oncopeltus fasciatus* Dallas

Guaymas, April 11 to 15; Mulegé, May 15; Pond Island Bay, Angel de la Guardia Island, June 30.

50. *Lygæus ruficeps* Stål

San Carlos Bay, Sonora, July 9, two examples.

51. *Lygæus reclivatus* Say

Guaymas, April 11 to 15; Angeles Bay, June 25; Las Animas Bay, May 8; Pond Island Bay, Angel de la Guardia Island, June 30; Mulegé, May 14; La Paz, June 3.

52. *Lygæus melanopleurus* Uhler

Pond Island Bay, Angel de la Guardia Island, July 1; Palm Cañon, Angel de la Guardia Island, May 3; Loreto, May 20.

53. *Lygæus carnosulus* Van Duzee

Mulegé, May 15, one example.

54. *Lygæus facetus* Say

Puerto Refugio, Angel de la Guardia Island, May 1; one teneral example taken from dry rotten cactus by J. C. Chamberlin. At Guaymas, April 7, I took two nymphs that seem to belong here.

55. *Nysius californicus* Stål

San Marcos Island, June 19; San Pedro Bay, Sonora, July 7.

56. *Nysius ericæ minor* Uhler

Isla Raza, May 4, one example.

57. *Nysius strigosus* Uhler

Pond Island Bay, Angel de la Guardia Island, July 1.

58. *Geocoris pallens* Stål

South Santa Inez Island, May 13, taken in large numbers on a patch of mixed *Chenopodium* and *Atriplex*; Mulegé, May 15; Angeles Bay, June 27; San Pedro Martir Island,

April 18, on *Vaseyanthus insularis*. During the dry season these insects seem to congregate on any plant that remains more green and fresh.

59. *Geocoris pallens solutus* Montondon

Mejia Island, April 30; San Francisco Island, June 19, two examples.

60. *Geocoris sonoraensis* Van Duzee, new species

Allied to, and perhaps but a subspecies of *punctipes*. Head smooth, mostly pale; callosities pale, distinct; base of scutellum with transverse calloused areas and obscure carinate line, venter mostly pale on sides. Length 4 to 5 mm.

Structural characters mostly those of *punctipes*; impressed median line of vertex continued nearly to the base; callosities almost or quite attaining anterior lateral angles of pronotum; basal calloused areas of scutellum subtransverse, not extended down the sides, nearly connecting with an obscure median carinate line which becomes obsolete just before the apex.

Color as in *punctipes*, but rather paler and less tinged with fulvous; head entirely pale except for a black basal vitta which covers the posterior face of the eyes and invades the impressed area exterior to the ocelli; median impressed line on tylus more or less infuscated; pronotum entirely pale, punctured with black as in *punctipes* but wanting the curved black cloud on the callosities; scutellum pale with the black punctures segregated at base, along the middle and at apex, forming blackish clouds there, calloused areas more fulvous; venter pale, in male with the disk pale castaneous becoming blackish at base, this area bordered by a polished yellowish vitta, more or less obvious, the black lateral vitta of *punctipes* occasionally represented by a few blackish marks; in the female the disk is broadly darker. Otherwise about as in *punctipes*.

Described from numerous examples of both sexes taken as follows: South Santa Inez Island, May 13, on *Atriplex*; Mulegé, May 14, 15; Loreto, May 20; Agua Verde, May 26; San Marcos Island, June 19; Las Animas Bay, May 8.

Type: Male, No. 996, and *allotype*, female, No. 997, Mus. Calif. Acad. Sci., collected May 13, 1921, on **South Santa Inez Island, Gulf of California.**

61. *Isthmocoris imperialis* Distant

San Carlos Bay, Sonora, July 9. In the one example taken the pronotum is mostly black but having a median spot on the anterior margin and the humeri pale.

62. *Phlegyas annulicrus* Stål

San Carlos Bay, Sonora, three examples.

63. *Ligyrocoris nitidulus* Uhler

Palm Cañon, Angel de la Guardia Island, May 3, 1 example; San Marcos Island, May 12, two examples not fully pigmented.

64. *Ligyrocoris aurivillianus* Distant

Loreto, May 20, taken with young under mats of *Heliotropium* near the beach; Espiritu Santo Island, June 9, under a rotten cactus stem. The nine specimens taken are all much more deeply colored than described by Distant, being largely of a piceous black.

65. *Orthæa vincta* Say

San Carlos Bay, Sonora, July 9, six examples.

66. *Peritrechus fraternus* Uhler

Gonzales Bay, April 28, one example. This individual has the membrane mostly white-hyaline and the antennæ ferruginous with the apical segment dusky.

67. *Euryophthalmus cinctus* Herrich-Schæffer

Common and widely distributed on the islands; larvæ on mesquite and especially on the related *Laccodesmia*. San Marcos Island, May 12, June 19; Angeles Bay, May 7, June 26; San José Island, May 23, Mulegé, May 15; Concepcion Bay, June 17; Guaymas, April 7.

68. *Dysdercus mimus* Say

Guaymas, April 11, one example.

69. *Piesma cinerea* Say

Puerto Ballandra, Carmen Island, May 21, one example, taken on *Hyptis occidentata*, differs in no respect from material taken about Buffalo, N. Y.

70. *Corythucha morrilli* Osborn & Drake

Mulegé, May 15; San Marcos Island, June 19.

71. *Corythucha gossypii* Fabricius

San Carlos Bay, Sonora, July 9. Found breeding in immense numbers on Palo San Juan; Coronados Island, May 18, abundant on *Atamisquaea emarginata*; San Esteban Island, April 20.

72. *Corythucha hispida* Uhler

San Pedro Martir Island, April 18; abundant on Abutilon; Puerto Ballandra, Carmen Island, May 21; Tortuga Island, June 22.

73. *Dolichocysta obscura* Van Duzee, new species

Broad ovate, greatest width across elytra a fourth more than that of pronotum. Hood semicircularly rounded, arched, almost attaining apex of bucculae, quadriseriate on either side; membranous sides of pronotum almost regularly arquate, biseriate anteriorly, subcoriaceous and punctate posteriorly; the three carinae uniseriate and sinuate medially, the median highest before the middle; costal area obscurely uniseriate, erect, the subcostal about six-seriate; bulbous elevation on elytra rounded, slightly flattened above, occupying three fourths of the median area and most of the width of the subcostal; costal membrane triseriate at base to uniseriate at apex. Segment III of antennae very slender, IV clavate and equal to I and II united. Rostrum hardly surpassing the prosternum; rostral groove parallel on mesosternum, abruptly doubled in width at middle coxae.

Color, pale brownish, varied with whitish and crossed by a darker band at base of hood and again behind elytral prominence; surface subopaque in places, with venation obscure; costal area and pronotal carinae with some black veins; clavate portion of segment IV of antennae embrowned; body black; femora castaneous. Length 2.75 mm. Described from the unique type.

Type: Female, No. 998, Mus. Calif. Acad. Sci., collected April 11, 1921, at Guaymas, Sonora.

74. *Calotingis knighti* Drake

Ceralbo, June 1. One example of this remarkable insect agrees in every respect with the description given by Drake.

75. *Gargaphia iridescens* Champion

San Marcos Island, May 12, one example.

76. *Gargaphia insularis* Van Duzee, new species

Allied to *opacula* Uhler and running to that species in Gibson's key. Length 3 mm.

Head blackish with a narrow white membranous area below the eye; spines short, yellowish; bucculae mostly white; antennae fuscous brown; segments I and II and apex of IV black. Pronotum black; hood squarish, slightly wider than long and, with the carinae and pronotal sides, clothed with long whitish hairs; pronotal carinae as high as hood, obscurely uniseriate; paranota rounded, wider than the carinae, erect, with two rows of areolae, the basal easily overlooked; membranous apex white. Elytra white, subopaque; costal area and sutural beyond tip of abdomen hyaline with large areoles and brown nervures; costal area biseriate, uniseriate at base and apex; subcostal triseriate; discoidal quadriseriate at widest part. Legs brown, tibiae paler. Body beneath black. Whole insect when mature covered with a white bloom which obscures some of the characters.

Described from 14 examples representing both sexes, taken on *Parosela emoryi* at Puerto Refugio, Angel de la Guardia Island, May 1. The broad hood, narrow rounded paranota, triseriate subcostal and quadriseriate discoidal areas will distinguish this species from *condensa* Gibson. The broader hood, lower and indistinctly areolate pronotal carinae, rounded paranota, and black pronotum will distinguish it from *carinata* Gibson. The shorter hood, black pronotum, erect broader paranota and higher carinae will distinguish it from *opacula* Uhler.

Type: Male, No. 999, *allotype*, female, No. 1000, Mus. Calif. Acad. Sci., collected May 1, 1921, on Angel de la Guardia Island, Gulf of California.

77. *Gargaphia gentilis* Van Duzee, new species

Allied to *iridescens* Champ., smaller, paler, with rounded paranota, smaller hood and shorter antennae. Length 3 mm.

Head black with the usual white subopaque margins and bucculae; spines long, testaceous; antennae yellowish; segments I and II except at base blackish, II as long as width of pronotum without the paranota. Pronotum black; hood formed as in *iridescens* but smaller and lower; carinae nearly as high as the hood, obscurely uniseriate; paranota rounded or scarcely subangulate, with two series of areoles and occasionally one or two additional areoles at widest part, together with the head and carinae clothed with long pale hairs; membranous apex soiled white. Elytra soiled white, all veins concolorous; costal area and most of subcostal hyaline; costal area regularly biseriate with a short third row at widest part; subcostal biseriate; discoidal quadriseriate. Legs yellowish. Body beneath castaneous or almost black, clothed as are the head and pronotum, with abundant yellowish white bloom.

The characters mentioned will distinguish this species from *iridescens*, especially the short second segment of antennae, which in *iridescens* is longer than the width of the pronotum including the paranota. *Gargaphia vanduzeei* Gibs. has the second antennal segment black, third nearly as long as in *iridescens*, pronotum pale, hood larger, broader posteriorly, costal area with larger areoles and no third row, and has a few fuscous veins as in *iridescens*.

Described from numerous examples, representing both sexes, taken on *Solanum hindsiana* at Puerto Ballandra, Carmen Island.

Type: Male, No. 1001, *allotype*, female, No. 1002, Mus. Calif. Acad. Sci., collected May 21, 1921, on Carmen Island, Gulf of California.

78. *Teleonemia sororcula* Van Duzee, new species

Closely allied to *schwarzi*, darker in color with segment IV of antennae much shorter. Length 3 mm.

Antennae stout, reaching to middle of scutellum; segment I and II subequal, I thinner; IV hardly a third of III; segments II, III and IV closely set with long hooked hairs which are somewhat longer than in *schwarzi*. Pronotum as in *schwarzi*, the carinae slender and percurrent, the paranota not more prominent than the carinae. Costal area of elytra narrow as in *schwarzi*, uniseriate; subcostal obscurely biseriate, areoles of sutural area (membrane) large and milky, the apical ocellate. Rostrum nearly attaining intermediate coxae. Color dark fuscous, becoming almost black on head and disk of pronotum; apical two thirds of tibiae whitish, tip of scutellum pale.

Described from three males and three females taken at Agua Verde, May 26.

Type: Male, No. 1003, and *allotype*, female, No. 1004, Mus. Calif. Acad. Sci., collected May 26, 1921, at **Agua Verde, Lower California.**

79. *Atheas tristis* Van Duzee, new species

Allied to *nigricornis* Champ., but differing in having a nearly uniseriate costal membrane. Length 2.3 mm.

Black, becoming more or less fuscous on elytra, paranota and costal area pale with fuscous veins. Antenniferous tubercles subacute; antennæ short and black as in *nigricornis*; segment I scarcely longer than II, IV nearly half of III. Narrow anterior margin of pronotum and paranota pale, the latter a little advanced and obtuse anteriorly, uniseriate; carinæ distinct, scarcely paler; triangular apical portion, like the elytra, paler or fuscous. Costal area of elytra uniseriate, briefly biseriate opposite apex of discoidal area; subcostal area regularly biseriate, the discoidal nearly attaining apex of abdomen. Legs and beneath black, the former sometimes fuscous; margin of bucculae pale; mesosternal carinæ very feebly converging at middle. Black portion of body more or less pruinose. Differs from *fuscipes* and *nigricornis* in the uniseriate costal area and minor characters.

Described from numerous specimens, representing both sexes, taken on *Æschynomene nivea* at Coyote Bay, Concepcion Bay, June 18.

Type: Male, No. 1005, and *allotype*, female, No. 1006, Mus. Calif. Acad. Sci., collected June 18, 1921, at **Concepcion Bay, Lower California.**

80. *Phymata erosa severini* Handlirsch

Common everywhere; Loreto, May 19; Pond Island Bay, Angel de la Guardia Island, June 20; Puerto Ballandra, Carmen Island, May 22; Mejia Island, April 30, larvæ; Santa Cruz Island, May 27, larvæ; Coronados Island, May 18; San Francisquito Bay, June 23; Escondido Bay, May 24; Espiritu Santo Island, June 9; San Pedro Bay, Sonora, July 7; La Paz, June 5.

81. *Macrocephalus prehensilis* (Fabricius)

Guaymas, April 10; San Marcos Island, June 19; Escondido Bay, May 24.

82. *Ploiaria californica* Baker

One mutilated and immature specimen taken on San Marcos Island, June 19, seems to be of this species.

83. *Ploiariopsis sonoraensis* Van Duzee, new species

Allied to *megalops* Champ., and like that species in having the eyes large, filling the entire width of the head at the median notch, and segment II of the antennæ nearly as long as I; head unarmed above. Length to tip of elytra 6.5 mm.

Head formed as in *predator* Champ., without the tubercles found in *megalops*, but with the large eyes of that species. Segment II of antennæ a sixth shorter than I; IV a fourth longer than III; the hairs on I and II as long as thickness (not width) of femora I. Pronotum as in *megalops*; mesonotum scarcely sulcate, flattened, sides sharply carinate, hind margin and scutellum unarmed. Femora I with five longer spines (about half as long as width of femora) on outer row and three shorter ones between each pair; inner row very minute with one or two longer at base; trochanters bispinose; tibiæ I two thirds of femora as in *reticulata* Baker; tarsi attaining tip of trochanters.

Color, pale testaceous; head, median line and broad band either side on mesonotum dusky; abdomen infuscated; anterior femora varied with darker; antennæ and legs brownish, the incisures of the former narrowly pale; apex of femora and base of tibiæ on intermediate and posterior legs more broadly pale and including a faint darker annulus; hyaline apical half of elytra marmorate, with darker veins; apex of venter with a black mark.

Described from one male taken in a cavity at root of a dry and rotten *Cercus pringleyi* on San Diego Island, June 11. One larva taken on Isla Raza, April 21, and one on Espiritu Santo Island, June 9, seem to belong to this species.

Type: Male, No. 1007, Mus. Calif. Acad. Sci., collected June 11, 1921, on San Diego Island, Gulf of California.

84. *Oncocephalus erectus* Van Duzee, new species

Related to *nubilus* Van Duzee, but smaller and darker; fusous, varied with paler; apical spine of scutellum, humeral and anterior angles of pronotum sanguinous; antennæ long-pilose. Length 14 mm.

Anteocular portion of head a little longer than its width at antennæ; flattened tubercles between antennæ longer than wide; tubercle behind antennal base bi-setose as in allied species. Segment I of antennæ scarcely longer than head; II almost three times I; II and lateral and

lower surfaces of I long-setose, the longer hairs as long as dorsal length of eye; III a little longer than IV. Anterior angles of pronotum produced in oblique truncate lobes; humeri produced outwardly, subspinose; anterior lobe sulcate posteriorly, posterior with two median diverging carinæ, becoming obsolete half way to hind margin. Apical spine of scutellum long, terete, up-turned and red. Ventral carina attaining apex of fifth segment, the posterior submargin of each segment with a few obsolete granules. Anterior femora with a nearly uniform row of eleven short teeth.

Color fuscous-brown, darker on scutellum and pronotum; eyes and ocellar elevation black; median line of vertex, antennal insertions and tubercles between them pale; base of pronotum with a pale area, with a smaller one near base of elytra; costal area pale including much of the membrane, each membranal areole with a vague darker cloud exteriorly, the nervures dark; wings whitish; legs pale, the femora with a broad apical and median annulus fuscous; knees pale; tibiæ with base, apex and median band fuscous; connexivum varied with ferruginous red; pleuræ piceous, the acetabulæ and broad hind margins of propleuræ pale. Described from the unique type.

Type: Male, No. 1008, Mus. Calif. Acad. Sci., collected May 4, 1921, at light, at Angeles Bay, Lower California.

85. *Triatoma rubrofasciatum* De Geer

Isla Partida, June 25, in birds' nests among rocks, collected by Virgil Owen; Pond Island Bay, Angel de la Guardia Island, June 30, Virgil Owen; Pond Island, July 1, J. C. Chamberlin; Guadalupe Point, Concepcion Bay, June 17, J. C. Chamberlin. I also took the young in nests of field mice on Santa Catalina Island, Gulf of California, June 12.

86. *Rasahus thoracicus* Stål

Guaymas, April 11, one example.

87. *Apiomerus crassipes* Fabricius

San Francisco Island, May 30, one example.

88. *Zelus (Diplocodus) lævicollis* Champion

Common and widely distributed. Mulegé, May 14, 15; Las Animas Bay, May 8; Pond Island Bay, Angel de la Guardia Island, July 1; Angeles Bay, June 25, 26; Guaymas, April 10, 11; Loreto, May 19, 20; Santa Inez Island, May 13; San Francisquito Bay, May 10; Escondido Bay, May 24;

San Marcos Island, June 19; Espiritu Santo Island, June 1. In most examples the corium has only the nervure pale at apex and the disk of the posterior lobe of the pronotum is pale.

89. *Zelus (Pindus) socius* Uhler

Isla Raza, April 21; Puerto Refugio, Angel de la Guardia Island, June 29; Guaymas, April 11.

90. *Pselliopus spinicollis* (Champion)

Puerto Refugio, Angel de la Guardia Island, May 1, one example.

91. *Fitchia spinosula* Stål

Guaymas, April 11.

92. *Sinea confusa* Caudell

San Carlos Bay, Sonora, July 9, one example.

93. *Sinea complexa* Caudell

Angeles Bay, June 25, 26; Mulegé, May 15.

94. *Sinea rileyi* Montondon

Guaymas, April 9; Marquer Bay, Carmen Island, May 23.

95. *Nabis ferus* Linnæus

Mulegé, May 14; South Santa Inez Island, May 13.

96. *Triphleps tristicolor* White

San Pedro Martir Island, April 18, on *Vaseyanthus insularis*; San Lorenzo Island, May 9; Mulegé, May 15; Santa Inez Island, May 13; Ceralbo Island, June 1, on *Conanthus*.

97. *Trigonotylus brevipes* Jakowlef

Guaymas, April 11; Mulegé, May 14, 15; San Carlos Bay, July 9, on fine grasses near water.

98. *Oncerometopus nigriclavus* Reuter

Mejia Island, April 10; a long series, mostly females and young, were taken from *Argythanus placeta* growing in a dry wash.

99. *Neurocolpus mexicanus* Distant

Guaymas, April 10; on acacia trees in great numbers, some immature.

100. *Phytocoris inops* Uhler

Guaymas, April 11; Loreto, May 19; Mejia Island, April 30; Angeles Bay, May 5; Escondido Bay, May 24. The Angeles Bay specimen is a female and may represent a distinct species.

101. *Phytocoris lenis* Van Duzee, new species

Closely allied to *inops*, a little smaller with the margin of the male pygofer unarmed. Length 4.5 mm.

Male: Vertex flat, depressed between the very prominent eyes, its width two-thirds that of the eye. Head short, produced before the eyes for a space about equal to the width of the eye at the insertion of the antennæ. Antennæ long; segment I a little longer than from front of head to apex of scutellum. Hind femora tapering from middle; hind tibiæ as long as corium and cuneus together. Sinistral clasper small, obliquely angled at base; tip not reaching the subacute apex of the ventral plate; dextral clasper about as long as the sinistral, passing apex of the segment; pygofer unarmed, wanting the dorsal tooth found in *inops*.

Colors as in *inops*, varied with fuscous and testaceous brown; inner margin of clavus, an angular spot covering apex of corium and external base of cuneus, whitish; membrane dotted as in *inops*, the vein and two marginal spots blackish; antennæ black, segment I dotted, II with base and median annulus (as wide as anterior femur) white, III and IV brown, base of III white; legs dotted as in *inops*, the hind femora blackish, dotted but hardly showing a subapical annulus, above with a broad median pale ray from base to beyond middle; chest blackish; coxæ, edges of acetabulæ and propleura whitish; sides of pronotum with a pale line behind the eyes; tibiæ black with three white bands, four on hind pair.

Female: Differs from male principally in having the vertex broader and fuller and the eyes smaller as is usual in allied species.

Described from one pair taken on mesquite at Agua Verde, May 26; one male from San José Island, May 28; one female

from San Marcos Island, May 12; and one female from Puerto Ballandra, Carmen Island, May 22.

Type: Male, No. 1009, and *allotype*, female, No. 1010, Mus. Calif. Acad. Sci., collected May 26, 1921, at Agua Verde, Lower California.

102. *Phytocoris pulchricollis* Van Duzee, new species

Elongate, cinerous, tinged with greenish on pronotum; head, scutellum and beneath fuscous, the former with white median line; antennæ annulate. Length 5 mm.

Male: Head produced for a space about equal to length of eye; vertex broad, moderately convex, nearly twice as wide as eye. Antennæ long and slender; segment I as long as head and pronotum together, a little thicker on basal half; II not quite twice as long as I; III a little shorter than II; IV longer than I. Pronotum twice wider than long, sides straight. Elytra parallel, two and a half times as long as together wide. Sinistral clasper small, appearing convex-triangular with a deep, rounded apical notch, its incurved apex concealed in situ; dextral clasper small, widened basally with an acute apex; pygofers unarmed but tumid above.

Color, cinerous with a slight tinge of greenish which is more pronounced on pronotum; head black, median line, apex of tylus and cheeks whitish; antennæ blackish, white-pubescent; segment I with three or four white dots above; II with an annulus close to base and another just beyond middle and about three dots between these, white; III with white basal annulus; pronotum with white median line, varied with fuscous anteriorly, with a discrete crenulate subbasal fuscous line; elytra more or less clouded with fuscous along inner and outer areas of corium and on claval nervure and apex of cuneus; tip of embolium and cuneus black; membrane white, closely irrorate with fuscous leaving two white marginal spots beyond tip of cuneus, veins fuscous at base, the inner vein continued as a fuscous line well toward apex of membrane; scutellum black with apex and small spot either side pale fulvous; mesosternum, pleuræ and venter largely fuscous; legs whitish, femora infuscated at apex; tibiæ dotted, the anterior blackish, biannulate with white; rostrum pale, attaining middle of venter. Whole surface rather densely clothed with soft white deciduous hairs intermixed with a few black ones.

Female differing by having the brown markings more extended.

Described from two males taken on San Marcos Island, May 12 and June 20; one pair from Puerto Ballandra, Carmen Island, May 21, 22, and a teneral female from Marquer Bay, Carmen Island, May 23.

Type: Male, No. 1011 (and *allotype*, female, No. 1012), Mus. Calif. Acad. Sci., collected June 19, 1921, on San Mar-

cos Island, Gulf of California. Allotype, female, No. 1012, collected May 22, 1921, at Puerto Ballandra, Carmen Island, Gulf of California.

103. *Phytocoris geniculatus* Van Duzee

Angeles Bay, May 5, on *Frankeria palmeri*; San Esteban Island, April 19, three immature specimens that apparently belong here.

104. *Phytocoris loretoensis* Van Duzee, new species

Aspect of *Compsocorocoris* Reuter; allied to *geniculatus*, a little shorter with the costa slightly more arcuate; cinerous-testaceous, varied and punctate with brown, with a pinkish aspect; pronotum discretely dotted. Length 5 mm.

Male: Vertex moderately convex, one half broader than the eye; front prominent; head short produced beyond the eyes for a space equal to their width. Segment I of antennæ a little shorter than the combined length of head and pronotum; II as long as from base of scutellum to tip of clavus; III equal to I. Pronotum two and a half times as wide as long, posterior submargin with four low, tumid elevations. Elytral costa feebly arcuate. Color testaceous gray, more or less tinged with pinkish; vertex and anterior lobe of pronotum yellowish with a few red marks and dots; posterior disk washed with fuscous with many discrete fuscous punctures each carrying a black hair; posterior submargin with a four-lobed fuscous vitta behind the nodular elevations. Scutellum with a few punctures and two black dots before the apex; elytra washed with pale rose and obviously punctate; costa and apex varied with fuscous, the latter with two black points on inner margin of cuneus; membrane white, sparsely irrorate with pale fuscous, forming a few clouds on margin, veins irrorate with red; antennæ obscurely dotted on segment I, II with two broad faint bands; beneath varied with rufous-brown, the mesosternum fuscous; sides of venter with an incomplete blackish vitta, beginning as a geminate line behind the eye; femora dotted with brown, anterior and intermediate tibiæ faintly triannulate, the posterior dotted. Surface with mixed black and white hairs.

Described from 12 females taken on *Lycium richii* at Loreto.

Type: Female, No. 1013, Mus. Calif. Acad. Sci., collected May 20, 1921, at Loreto, Lower California.

105. *Phytocoris vanduzeei* Reuter

Gonzales Bay, April 29. The one individual taken, a female, has the membrane almost entirely hyaline.

106. *Creontiades femoralis* Van Duzee

Abundant everywhere on Salicornia. Isla Raza, May 4, just reaching maturity; Loreto, May 20; Santa Inez Island, May 13; San Francisco Island, May 30. The red tints on the elytra are mostly wanting or are replaced by green, indicating perhaps a condition of immaturity.

CALYPTODERA Van Duzee, new genus

Allied to *Charagochilus* with which it agrees in aspect and general characters except for the broad overlapping head. Head, pronotum and scutellum moderately polished, closely, obsoletely rastrate-punctate; the elytra subopaque, more deeply rastrate; whole surface irregularly white-pubescent with a few brown hairs intermixed. Head nearly vertical, broad and with the eyes overlapping the anterior angles of the pronotum, leaving the collum exposed for a short space at the middle; its width, when viewed from above, about three times its length and twice the length of the pronotum; when viewed from before its width is one fourth greater than its length; vertex transversely impressed before the complete basal carina; front moderately convex. Antennæ as long as body to base of cuneus; segment I attaining apex of head; II three times the length of I, III and IV subequal to I. Pronotum moderately convex; humeri prominent; antero-lateral margins rectilinear. Scutellum equilateral, strongly convex. Elytra broad and short; costa strongly arcuate; veins obsolete, cuneus abruptly declinate; membrane biareolate. Segment I of hind tarsi below twice the length of II and equal to III; orifices distinct; rostrum passing middle of venter. Genotype, *Calyptodera robusta* Van Duzee, n. sp.

107. *Calyptodera robusta* Van Duzee, new species

Yellowish testaceous; clypeus, except at sides, a large spot covering disk of vertex and including a pale median line and the sutures of the cheeks castaneous; an arcuate line above the base of the antennæ blackish; antennæ pale; pronotum mostly castaneous brown, edges, collum and an angular spot behind the callosities pale, region of the callosities otherwise castaneous; scutellum varied with brown; elytra brown with a large, vague pale costal area at base, another beyond the middle and a smaller one on the cuneus; membrane fuscous with many irregular whitish hyaline spots, the areoles castaneous brown, veins white at apex; beneath whitish; mesosternum blackish; margin of mesopleura croceus; sides and apex of venter and hind tibiae with a few brown points, the femora with three or four blackish dots near apex; rostrum blackish at apex. Length 4 mm.

Described from two females beaten from a tree of *Sideroxylon leucophyllum* at Palm Cañon, Angel de la Guardia Island, May 3. This insect is so distinct it seems safe to describe it from one sex only. In Reuter's keys it runs to

Charagochilus and in mine of 1916, where Charagochilus is not included, it runs to Pæciloscytus, from both of which it is at once distinguished by the broad overlapping head.

Type: Female, No. 1014, Mus. Calif. Acad. Sci., collected May 3, 1921, on Angel de la Guardia Island, Gulf of California.

108. *Lygus hospitus sonoraensis* Van Duzee, new subspecies

Differs from Distant's description of *hospitus* in wanting the fuscous apex to segment II of antennæ and in possessing three pale spots on the membrane, one large median and a smaller round one either side beyond apex of cuneus. From *olivaceous* Reuter it differs in wanting the fuscous apex to segment II of antennæ, in having the pronotum pale anteriorly, in the maculate scutellum and in having a broader apical band on the corium and the cuneus dusky except at apex; frequently, also, the median area of the corium is castaneous brown. It is possible these all are local races, or subspecies, of one species. Frequently the scutellum in *sonoraensis* is castaneous with three pale spots. Length 4 mm.

Described from numerous examples taken on mesquite at the following localities: San Nicolas Bay, May 16; Agua Verde, May 26; Loreto, May 19; Concepcion Bay, June 17; Mulegé, May 15.

Type: Male, No. 1015, and *allotype*, female, No. 1016, Mus. Calif. Acad. Sci., collected May 16, 1921, at Agua Verde, Lower California.

109. *Cimatlan delicatum* Distant

Mulegé, May 14, one example. In this the pronotum is variegated with pale much as are the elytra.

TYLOCAPSUS Van Duzee, new genus

Aspect of Chius Dist., but pertaining to the Bryocorinæ. Elongate, parallel, subopaque, sparingly clothed with short hairs. Head cylindrical, vertical before; eyes small, placed at about middle of sides of head, leaving a neck as long as the eyes and as wide as anterior margin of pronotum; front tumid and rounded between the antennæ, overlapping base of clypeus; apex of head as seen from side subacute, exceeding the eyes by a space as great as the length of the eye; clypeus prom-

inent with deep incisures at base. Segment I of antennæ attaining apex of head, moderately incrassate; II twice the length of I; III two thirds of II; IV equal to I. Pronotum nearly flat, base broadly excavated, sides rectilinear collum narrow, discrete; humeri subacute; scutellum equilateral, moderately convex. Elytra parallel, exceeding abdomen by one third their length. Membrane uniareolate. Rostrum attaining intermediate coxæ; segment I reaching base of head. Tarsi nearly cylindrical, a little flattened at apex when immature. The produced cylindrical head, overhanging front, and short basal segment of antennæ will distinguish this from any allied genus. Genotype *Tylocapsus lopezi* Van Duzee, n. sp.

110. *Tylocapsus lopezi* Van Duzee, new species

Deep fuscous; antennæ except base, legs, abdomen and elytra whitish, the latter with clavus and large spot at apex fuscous. Length 2 mm.

Head and pronotum usually with a pale median line; segment I of antennæ deep black, remaining segments whitish; clavus and a large squarish spot on corium at claval tip fuscous, this spot reaching the costa narrowly; tip of cuneus fuscous; membrane pale fuscous, veins darker, margin with roundish clear spots at apex of cuneus; rostrum, legs and abdomen pale, the latter more or less widely black along middle and at apex; tips of tarsi darker; upper surface clothed with scattering pale hairs.

Described from numerous examples taken as follows: Agua Verde, May 26, on *Perityle robusta*; Tortuga Island, May 11; Pond Island Bay, Angel de la Guardia Island, July 1; San Francisco Island, May 30; Palm Cañon, Angel de la Guardia Island, May 3, on *Eucnide cordata*, mostly immature at that time. It affords me pleasure to name this interesting species after Señor Carlos Lopez, of the Mexican Museum, who was a member of our party and whose unfailing courtesy made the discomforts of the expedition seem much less annoying.

Type: Male, No. 1017 (and *allotype*, female, No. 1018, from Agua Verde), Mus. Calif. Acad. Sci., collected July 1, 1921, at Pond Island Bay, Angel de la Guardia Island, Gulf of California.

111. *Dicyphus disclusus* Van Duzee, new species

A small pale species with a round blackish spot before the apex of each elytron and a few dark marks on head, antennæ and scutellum. Length 2.5 mm.

Head polished; eyes smaller and vertex more convex than in *vestitus*; neck behind the eye a little less than diameter of eye; segment I of antennæ attaining apex of head; II scarcely three times I; III subequal to II; IV longer than I; sides of pronotum nearly rectilinear; callosities not so prominent as in allied species; elytra together a third as wide as long, subhyaline, surface clothed with scattering stiff white hairs. Color, creamy white; head with large discal spot above and broad base fuscous, or fuscous with a large spot against each eye and the cheeks pale; pronotum dusky on base and at tips of humeri; basal angles, sometimes divided, and median line on apical lobe of scutellum fuscous; elytra with a large round spot on corium opposite tip of clavus and almost touching costa and tip of cuneus fuscous; apical third of clavus faintly dotted with brown; membrane pale fuliginous with large pale spots beyond apex of cuneus; antennæ with segment I broadly, II near base and apex and III and IV faintly, smoky; tips of rostrum and tarsi brown; inferior margin of pronotum and apex of male abdomen at times embrowned.

Described from numerous specimens taken from *Solanum hindsianum* on San Lorenzo Island, May 9.

Type: Male, No. 1019, and *allotype*, female, No. 1020, Mus. Calif. Acad. Sci., collected May 9, 1921, on San Lorenzo Island, Gulf of California.

112. *Dicyphus diffractus* Van Duzee, new species

Allied to *disclusus* but paler and wanting the round elytral spots and the dark markings of the head. Length 2.5 mm.

Head narrower than in *disclusus*, the vertex more produced between the antennæ and exceeding the clypeus, the suture very deep. Segment I of antennæ longer; II scarcely more than twice I; III a little shorter than II; IV equal to I. Color, testaceous white; segment I of antennæ fuscous when mature; clypeus and vertex more embrowned; pronotum pale brownish, whitish along either side and less obviously so on the median line, callosities tinged with yellow. Scutellum dusky with pale median line; elytra subhyaline, apical half of clavus irrorate with pale brown, its scutellar and commissural margins slenderly fuscous; corium sparsely irrorate within, forming a small dusky spot at inner apical angle; posterior margin of cuneus at tip embrowned; membrane faintly smoky, with brown nervures and whitish spot at apex of cuneus; tip of rostrum and tarsal claws fuscous.

Described from one male and three female examples taken at Puerto Ballandra, Carmen Island. This species seems to connect *Dicyphus* with *Engytatus*, having the head shorter behind the eye than in *Dicyphus*.

Type: Male, No. 1021, and *allotype*, female, No. 1022, Mus. Calif. Acad. Sci., collected May 21, 1921, at Puerto Ballandra, Carmen Island, Gulf of California.

113. *Engytatus geniculatus* Reuter

Guaymas, April 11, one male. This species was described from Texas and has been reported from Florida. I have taken it at San Diego, Calif. Dr. Reuter fails to mention a remarkable male character, the ventral aspect of the genital segment being greatly produced and divided into two long curved horns.

114. *Lopidea eremita* Van Duzee, new species

Form and aspect of *hirta* Van D., but with male claspers approaching those of *occidentalis* Van D.; broad oval, dark reddish becoming black on head and pronotum, costal area clearer red. Length 5.5 mm.

Surface opaque, dull, sparsely clothed with short stiff black hairs which become pale in places; costa greatly arquated, broadly explanate. Pronotum narrow anteriorly, sides nearly rectilinear, collum little produced between the callosities. Base of vertex deeply impressed. Segment II of antennæ a seventh shorter than basal width of pronotum; vertex and clypeus more prominent than in *nigridea*. Sinistral male clasper as seen in situ broad, the apex hidden under the base of the dextral; dextral still broader near the base, bent at right angle across the apex of the genital segment, the transverse portion very long, tapering to a subacute apex which passes the sinistral side of the pygofers. In *occidentalis* this clasper is as long but much broader, and the sinistral clasper is also broader.

Color above, black or nearly so; elytra dusky sanguineous with the costa broadly brighter red, or in the male with the elytra mostly red; membrane pale fuliginous, veins red to fuscous; collum in part and a large triangular spot on the vertex against each eye pale yellow; antennæ and legs black; beneath pale yellowish varied with fuscous, especially on sternum and disk of venter; male genitalia dull croceous; cheeks pale.

Described from two male and three female examples taken on palo tinto (uña de gato) on Monserrate Island, May 25.

Type: Male, No. 1023, and *allotype*, female, No. 1024, Mus. Calif. Acad. Sci., collected May 25, on Monserrate Island, Gulf of California.

115. *Hadronema infans* Van Duzee

Puerto Refugio, Angel de la Guardia Island, May 1, on *Parosela emoryi*.

116. *Orthotylus vigilax* Van Duzee, new species

A small green species with large eyes, narrow vertex and short antennæ. Length 3 mm.

Male: Head short, transverse, with eyes twice wider than long; vertex much narrower than width of an eye, depressed, basal carina obtuse, obsolete at middle; front, viewed from above, scarcely advanced before the eyes; antennæ rather short and stout; segment I attaining apex of head; II three times as long as I; III shorter than II. Pronotum twice as wide as long, strongly, roundingly, narrowed anteriorly; sides carinate, feebly sinuate before the subacute humeral angles. Rostrum attaining middle of mesosternum. Sinistral clasper very small, apex curved, acuminate; dextral very slender, curved over to meet the sinistral.

Color, pale dull yellowish green, deeper on the marginal veins of the elytra and membranal nervures, becoming yellowish on the head, anterior lobe of pronotum, antennæ, legs and beneath; tip of rostrum and tarsal claws black; surface clothed with scattering pale hairs. Described from the unique type.

Type: Male, No. 1025, Mus. Calif. Acad. Sci., collected May 20, 1921, at Loreto, Lower California.

117. *Parthenicus candidus* Van Duzee

Puerto Ballandra, Carmen Island, May 21, one example taken on a mint-like plant.

118. *Parthenicus mundus* Van Duzee, new species

Allied to *candidus*, but more testaceous with the hind femora closely fusco-punctate and the antennæ immaculate except for a single annulus on segment I. Length 3.5 mm.

Testaceous, slightly tinged with pink, clothed with long white deciduous hairs, with a cluster of black scales on base of scutellum and at apex of clavus; vertex tinged with fulvous; sutures of cheeks sanguineous; pronotum with a few sanguineous dots and four or five are on the membranal veins, the membrane faintly enfumed and coarsely fusco-punctate; antennæ brownish testaceous with a narrow ciliate sanguineous annulus at apical third of segment I; beneath fusco-sanguineous, paler on base of venter; coxæ and legs whitish, femora sanguino-punctate, the points on the posterior pair darker and subconfluent; tibiæ with large dots at base of the bristles; tarsi yellowish, claws black. Dextral male clasper long, slender, curved, armed dorsally with about four long bristles; sinistral clasper small as seen in situ, scarcely reaching end of segment. In *candidus* the sinistral clasper is broader and acuminate at apex.

Described from four male and six female examples taken as follows: Agua Verde, May 26; Angeles Bay, May 5; Santa Cruz Island, May 27; San Lorenzo Island, May 9; San Francisquito Bay, May 10, all on *Atriplex*. The female from San Lorenzo Island is whitish with markings nearly obsolete and is apparently immature.

Type: Male, No. 1026, and *allotype*, female, No. 1027, Mus. Calif. Acad. Sci., collected May 26, 1921, at Agua Verde, Lower California.

119. *Parthenicus psalloides* Reuter

San Lorenzo Island, May 9; Mejia Island, April 30.

120. *Parthenicus percroceus* Van Duzee, new species

Small, ovate, uniformly reddish croceus, membrane deep fuliginous with small clear spot at tip of cuneus. Length 2.7 mm.

Head with eyes two thirds the greatest width of pronotum; sides of pronotum gently arcuated; elytral costa quite regularly arcuated, the membrane slightly exceeding the tip of the abdomen. Color almost uniformly croceus-red, touched with sanguineous on the scutellum, base of elytra and cuneus; membrane deep smoky with a hyaline mark at apex of cuneus, the nervures sanguineous at apex; antennæ and legs paler, the tibiæ minutely dotted at base of spines; claws black; Rostrum attaining middle of venter, tipped with black; tibial spines longer than width of tibia; surface sparsely clothed with long pale hairs with black scales on commissure of corium and inner margin of cuneus.

Described from four females taken on creosote bush at Guadalupe Point, Concepcion Bay, June 17, and one female from Salinas Bay, Carmen Island, June 16. This species is proportionately broader and more oval in outline than our other described species, with somewhat the aspect of a miniature *Oncotylus* but the connivent arolia and saltatorial hind femora place it here.

Type: Female, No. 1028, Mus. Calif. Acad. Sci., collected June 17, 1921, at Guadalupe Point, Concepcion Bay, Lower California.

121. *Parthenicus picicollis* Van Duzee

San Francisquito Bay, May 10, one example.

122. *Parthenicus ruber* Van Duzee

Agua Verde, May 26, one example.

123. *Oncotylus biguttulatus* Uhler

San Pedro Martir Island, April 18, numbers taken, with their young, on a vine of *Vaseyanthus insularis* growing in the shade of a giant cactus, well up toward the highest point of the island. Although closely mimicking a *Psallus* in form and marking it has the prosternal xyphus distinctly margined and is an undoubted *Oncotylus*. I took one specimen of this species at Mussey's, near San Diego, California, April 11, 1914, which differs from the present examples and from the types of the species in no way except in being larger and more heavily marked.

124. *Oncotylus nuperus* Van Duzee, new species

Aspect of *guttatipes*, a little smaller and having the dotting on the legs nearly obsolete and the tibial spines pale; pale green with minute pale pubescence. Length 4 mm.

Oblong-ovate, moderately polished, clothed with minute pale hairs which become brownish on the cuneus and costa. Head three fifths the humeral width of pronotum, nearly vertical; vertex and front together convex; surpassing the eye for a space about equal to width of eye. Antennae reaching the tip of corium; segment I passing apex of head; II four times the length of I, a little shorter than width of pronotum; III three fourths of II; IV one half of III. Pronotum transverse, its length nearly one half its width; sides strongly oblique, the anterior angles much rounded; Elytra short, the tip of abdomen reaching midway from tip of corium to apex of membrane. Legs and antennae minutely white pubescent; tibial bristles weak and pale. Male claspers very small and obscure.

Color pale green, tinged with yellow on head and becoming whitish on elytra; antennae and legs pale, the former testaceous toward apex; femora faintly dotted with brown; tibiae with small dots at base of the bristles; tarsal claws black.

Described from 12 examples taken on *Salicornia* on San Francisco Island, May 30. A larger series, taken on *Salicornia* at Tepoca Bay, April 25, differ in being a little smaller and more testaceous in color, possibly not fully pigmented; three from Santa Inez Island, May 13, are similar to those from Tepoca Bay. In my own collection is a considerable

series taken by me at Pueblo and Grand Junction, Colorado, in July, 1900, that are a little larger than the type and more yellowish in color but apparently not distinct.

Type: Male, No. 1029, and *allotype*, female, No. 1030, Mus. Calif. Acad. Sci., collected May 30, on **San Francisco Island, Gulf of California.**

125. *Psallus flora* Van Duzee, new species

Of a clear lemon-yellow with a black dot on margin of membrane, the antennæ white dotted with black. Length 3.5 mm.

Male: Form of *guttulosus* nearly, broader and more ovate than *juniperi* and its allies. Head three fifths the basal width of pronotum; vertex broad, slightly convex, a half wider than an eye; front and clypeus together feebly arcuated, exceeding the eye for a space equal to the median width of the eye. Antennæ short, as long as the elytra to middle of cuneus; segment I attaining apex of head; II as stout as I, three fourths as long as basal width of pronotum; III one half of II; IV one half of III. Pronotum broader anteriorly than in allied species, sides rectilinear, anterior angles scarcely rounded. Elytral costa gently arcuated, abdomen passing apex of cuneus. Rostrum attaining intermediate coxæ. Claspers much as in allied species, the dextral rather large and obtuse at tip.

Color, deep lemon-yellow or almost golden at times, beneath with femora paler; antennæ, coxæ, tibiæ and tarsi whitish; segment I of antennæ with a black bristle and dot at apical third; II, III and IV with base narrowly fuscous; II with two geminate dots above; inner angles of cuneus with small clusters of black hairs; membrane faintly fuliginous, with a broad hyaline area across at apex of cuneus, divided by a black marginal spot connected by a slender line to apex of the nervures; these nervures yellow at apex, fuscous and clouded exteriorly; tibiæ with stout black spines set in minute black points; tarsi tipped with black; hind femora faintly, irregularly dotted with brown at apex, these dots showing only in fully mature individuals. Surface sparsely clothed with fuscous hairs.

Described from numbers of both sexes taken at Mulegé, May 14, on the yellow flowers of *Wislizenia refracta*, the color of which they match exactly. It is a beautiful species and very distinct by its bright yellow color.

Type: Male, No. 1031, and *allotype*, female, No. 1032, Mus. Calif. Acad. Sci., collected May 14, 1921, at **Mulegé, Lower California.**

126. *Psallus seriatus* Reuter

Monserrate, June 13, one example. This individual agrees with a series taken at San Diego, Calif., and answers perfectly to Reuter's description except that the tibiae are distinctly nigro-punctate at base of spines, at least on basal one third. The sinistral clasper of the male is produced in an acute spine either side the base of the channel for the reception of the aedeagus.

127. *Psallus aspersus* Van Duzee, new species

Aspect of *sulphureus* and *pantherinus* but smaller, with the membrane dotted uniformly with the elytra; form ovate-oblong. Length 2.5 to 3 mm.

Male: Head broader, eyes larger and pronotum shorter than in *sulphureus*, more as in *pantherinus*; produced before the eyes for a space less than the width of the eye. Pronotum twice as long as broad, its apical width two thirds its basal. Elytral costa moderately arcuated. Rostrum attaining apex of hind coxæ. Segment I of antennæ scarcely passing apex of head; II as long as basal width of pronotum; III about one half of II; IV equal to I. Sinistral clasper small; dorsal basal angle forming a short tooth, apical angle obtuse, broadly rounded (in *pantherinus* this clasper is long with each dorsal angle produced in a curved horn); dextral clasper broad with its apex truncate.

Color, pale greenish gray, becoming somewhat fulvous gray on pronotum and scutellum and testaceous-brown on the head; upper surface thickly dotted with rather large fuscous points which become smaller on the pronotum, scutellum and costal region of the elytra; head undotted; membrane milky hyaline, the dots somewhat confluent near its apex and more sparse at base, the veins pale; femora strongly dotted apically, especially on hind pair; tibiae strongly dotted at base of the pale bristles; tarsal claws black; antennæ pale testaceous, immaculate except for a black dot near apex of segment I; upper surface in fresh specimens thickly clothed with long pale hairs. The female differs as usual in having the eyes smaller and segment II of antennæ thinner. It has the base of the oviduct black.

Described from 19 examples taken on Ceralbo Island, June 6, 7; two from Monserrate Island, May 25; one from Puerto Ballandra, Carmen Island, May 21; one from San José Island, May 29; one from Agua Verde, May 26; and one from Santa Catalina Island, June 12, all taken on palo tinto. The closely, regularly dotted upper surface will distinguish this species.

Type: Male, No. 1033, and *allotype*, female, No. 1034, Mus. Calif. Acad. Sci., collected June 6, 1921, on Ceralbo Island, Gulf of California.

128. *Psallus gregalis* Van Duzee, new species

Aspect of *seriatus* somewhat, much smaller, paler and less narrowed anteriorly; whitish and pale pubescent, very faintly dotted. Length 2.3 mm.

Male: Head short, nearly vertical, with the eyes three fourths the basal width of pronotum, viewed from above twice wider than long; produced below the eye for a space equal to greatest width of eye. Pronotum short, more than twice wider than long, sides rectilinear, anterior angles briefly rounded. Segment I of antennæ just passing apex of head; II nearly as long as basal width of pronotum; III one half of II; IV two thirds of III; abdomen reaching to tip of cuneus. Sinistral clasper ovate, unarmed above; dextral elongate, acuminate, just passing apex of genital segment.

Color, whitish, white pubescent above; pronotum anteriorly tinged with yellow; tergum yellowish, the color showing through the subhyaline elytra; elytra very faintly dotted with brown, especially on costal half; membrane whitish hyaline, the dots larger and irregular toward apex, veins white; face and femora tinged with testaceous, the apex of hind femora very faintly dotted; tibiæ with minute black points at base of the white bristles; tarsi testaceous-white, claws black; antennæ immaculate. Some individuals, perhaps immature, are quite strongly tinged with green. Females paler with segment II of antennæ shorter.

Described from numerous specimens, mostly females, beaten from a tree of *Sideroxylon leucophyllum* in Palm Cañon, Angel de la Guardia Island, May 3.

Type: Male, No. 1035, and *allotype*, female, No. 1036, Mus. Calif. Acad. Sci., collected May 3, 1921, in Palm Cañon, Angel de la Guardia Island, Gulf of California.

129. *Psallus lemniscatus* Van Duzee, new species

Closely allied to *gregalis*, base of scutellum and a knot-like mark at inner angle of corium croceus. Length 2.6 mm.

Male: Head more oblique and pronotum more narrowed and longer than in *gregalis*, making the insect look more narrowed anteriorly. Segment II of antennæ as long as basal width of pronotum. Sinistral clasper small; dextral larger, a little longer than wide, abruptly bent and narrowed before the oblique, superiorly acuminate apex.

Color, soiled white, tinged with green on pronotum; anterior lobe of pronotum and head more or less inclined to fulvous as is the scutel-

lum; base of scutellum and a mark on commissural margin of corium croceous; elytra minutely and obscurely dotted with croceous; apical margin of cuneus with a few black scales; membrane whitish hyaline or very faintly, uniformly fuliginous, its veins whitish; apex of hind femora very minutely speckled with brown, the tibiae with small brown dots at base of the white bristles; antennae becoming brownish toward apex. Upper surface clothed with soft white hairs.

Described from one male and three females taken on San Esteban Island, April 19, and one female taken at Angeles Bay, May 4.

Type: Male, No. 1037, and *allotype*, female, No. 1038, Mus. Calif. Acad. Sci., collected April 19, 1921, on San Esteban Island, Gulf of California.

130. *Psallus tuberculatus* Van Duzee, new species

Allied to *aspersus*, pale green without irrorations; membrane fusco-marmorate; male genital segment with a lateral tubercle. Length 3 mm.

Male: Head and pronotum short and broad as in *aspersus* and *gregalis* but narrower and more parallel-sided; head with eyes two thirds the basal width of pronotum; costal margins of elytra very feebly arcuated. Segment I of antennae very short but attaining apex of head; II as thick as I and as long as basal width of pronotum; III and IV together three fourths of II. Sinistral clasper broad and short, unarmed; dextral linear, curved, blunt at apex; dorsal margin of genital segment armed with an erect tubercle.

Color, pale green, clothed with minute white pubescence; base of scutellum and head tinged with dull fulvous; membrane confluent marmorate with fuscous, more so toward apex, the base mostly white-hyaline, nervures pale with a fuscous line at base of radial; femora dotted with fuscous nearly to their base; tibiae with small fuscous points at base of the brown bristles.

Described from five males taken on mesquite at San Nicolas Bay, May 16; three males and three females from Puerto Ballandra, Carmen Island, May 22, also from mesquite.

Type: Male, No. 1039, Mus. Calif. Acad. Sci., collected May 16, 1921, at San Nicolas Bay, Lower California. *Allotype*, female, No. 1040, collected May 22, 1921, at Puerto Ballandra, Carmen Island, Gulf of California.

131. *Plagiognathus pictipes* Van Duzee

Agua Verde, May 26, abundant on Atriplex; Escondido Bay, June 14.

132. *Sthenarus humeralis* Van Duzee, new species

Aspect of *Plagiognathus pictipes* Van D., but darker colored with the cheeks broader either side of the clypeus; testaceous, head and pronotum, humeri excepted, piceous; abdomen greenish; legs dotted. Length 3 mm.

Head broad, nearly vertical, three fourths the basal width of pronotum, twice broader than long; vertex and front but moderately convex; clypeus not prominent, depressed at base; cheeks broad; base of vertex sharp either side the middle but hardly carinate. Basal segment of antennæ short, just attaining apex of head; II in male as thick as I, almost as long as width of head with eyes; III and IV together longer than I. Pronotum short, scarcely longer than head; sides short, oblique; angles rounded; callosities oblique. Elytral costa quite strongly arcuate. Rostrum attaining hind coxæ. Male claspers small and obscure.

Color, testaceous brown; head, pronotum and scutellum piceous brown; apex of scutellum, humeral areas and propleuræ sometimes paler; abdomen more or less greenish; legs reddish, femora and tibiæ rather coarsely dotted with fuscous or black; tibial bristles black; membrane uniformly smoky, veins concolorous; antennæ more or less tinged with reddish, pale at apex. Upper surface clothed with deciduous white scales and fuscous hairs.

Described from numerous examples beaten from bushes of *Lycium richii* at Loreto.

Type: Male, No. 1041, and *allotype*, female, No. 1042, Mus. Calif. Acad. Sci., collected May 20, 1921, at Loreto, Lower California.

133. *Tuponia pallidicornis* Van Duzee, new species

Allied to *subnitida* Uhler, a little larger, more tinged with yellow, with antennæ concolorous. Length 3 mm.

Head even broader than in *subnitida*, the eyes approximated more closely to anterior angles of pronotum; the latter more than twice broader than long; humeri extended beyond line of eyes by half the width of the eye; sides armed with a long black seta and there is another on vertex against inner margin of eye; callosities prominent, forming an arc but scarcely connivent; elytral costa feebly arcuated. Antennæ long; segment II as long as width of head with eyes; III a third shorter than II; IV one half of III. Rostrum reaching tip of hind coxæ.

Color testaceous, tinged with fulvous on antennæ, head, pronotum, base of scutellum and legs; disk of pronotum infuscated; elytra pale testaceous, subhyaline, the membrane slightly, evenly infuscated, veins pale; segment I of antennæ deeper fulvous; tibiæ pale, dotted with black

at base of the black spines; tip of rostrum and tarsi black; disk of venter infuscated. Upper surface clothed with appressed white hairs and more erect fuscous ones. Described from the unique type.

Type: Female, No. 1043, Mus. Calif. Acad. Sci., collected May 16, 1921, at San Nicolas Bay, Lower California.

134. *Chlamydatus suavis* Reuter

Mulegé, May 15, one example.

135. *Excentricus mexicanus* Van Duzee, new species

Closely allied to *californicus*; smaller, antennæ less expanded and membrane without the large pale discal spot but with a second small spot beyond apex of cuneus. Length 2.5 mm.

Most characters as in *californicus*. Segments I and II of antennæ decidedly less expanded and the pronotum proportionately shorter. Color black, above rather closely invested with deciduous pale hairs and white tomentum; segments III and IV of antennæ pale gray, white at base; elytra tinged with brown, paler on costal base; cuneus with extreme tip and basal fracture whitish; commissure with paler point at apex of clavus; membrane uniformly pale fuscous with spot at apex of veins, a lunule against apex of cuneus and small submarginal transverse mark beyond, whitish; rostrum pale piceous, black at base; tibiæ soiled white, faintly triannulate with fuscous and base of hind pair also fuscous; tips of tibiæ and tarsi also brown; tibial bristles pale. Described from the unique type.

This species is sufficiently distinct to be described from a single female.

Type: Female, No. 1044, Mus. Calif. Acad. Sci., collected May 10, 1921, at San Francisquito Bay, Lower California.

136. *Rhinacloa forticornis* Reuter

San Francisquito Bay, May 10; San José Island, May 28; Isla Raza, April 21; Santa Inez Island, May 13; San Lorenzo Island, May 9; San Nicolas Bay, May 16, on mesquite; Agua Verde, May 26; Mejia Island, April 30; Palm Cañon, Angel de la Guardia Island, May 3; Guadalupe Point, Concepcion Bay, April 23; Mulegé, May 15; San Pedro Martir Island, April 18, on Brandegea. This species shows considerable variation in color of the upper surface and legs. It was

abundant everywhere on mesquite and was found on many other plants.

137. *Hydrometra lentipes* Champion

Escondido Bay, June 14, one example taken in company with *Buenoa carinata* by J. C. Chamberlin.

138. *Gerris orba* Stål

Escondido Bay, June 14, J. C. Chamberlin; Angeles Bay, May 7.

139. *Trepobates pictus* Herrich-Schæffer

Mulegé, May 14, common on the Rosalia River where it flows through the town and becomes practically a tidal river, the water there being brackish and rising and falling with the tides; only brachypterous forms were taken. On June 9 I took somewhat immature examples from a small pond fed by a spring on Espiritu Santo Island. All individuals taken were darker in color than those from western New York.

140. *Microvelia americana* Uhler

San Marcos Island, June 19, one example. Taken on a small pond. Differs from New York examples in being smaller and narrower with the body more compressed and the antennæ slightly longer.

141. *Microvelia paludicola* Champion

Mulegé, May 14. A few brachypterous examples taken apparently belong here.

142. *Rhagovelia distincta* Champion ?

Mulegé, May 14. Seven brachypterous females taken answer very closely to Champion's description except that they are without the metallic green color and the apical angles of the ultimate dorsal segment are produced in long acute spines above which is a still longer suberect spine which

forms the apex of the connexivum. All were taken on brackish water with *Trepobates pictus*.

143. *Merragata hebroides* White

San Marcos Island, June 19. Taken on damp stones and on the surface of the water in a small pool which was shaded a part of the day by a palm tree. These differ from California examples by being smaller and paler.

144. *Orthophrys mexicanus* Van Duzee, new species

Short, ovate, black varied with pale testaceous; ocelli distant; pronotum transverse. Length 3.5 mm.

Head nearly vertical; with the eyes wider than anterior margin of pronotum; surface closely punctate. Clypeus strongly incurved at apex; inner orbits of the eyes with three or four long setae; ocelli equally distant from one another and from the eyes; inner margin of eyes scarcely sinuate posteriorly, slightly so medially next an elongated pit on margin of vertex; behind the eyes scarcely produced in a collum; eyes but slightly separated from the pronotal angles. Rostrum attaining fourth ventral segment. Pronotum transverse; anterior margin one fourth shorter than posterior; the length two fifths the width; sides rectilinear; base moderately arcuated over the base of the scutellum; callosities indistinct, forming a broad arc nearly attaining the middle of the hind margin, with a short, impressed, median transverse line anteriorly; surface closely evenly punctate. Scutellum as long as wide, acute at apex, closely punctate and lightly transversely impressed near the base. Elytra short, subbrachypterous, attaining apex of abdomen, coriaceous; costa strongly arcuated; membrane with four areolae, the exterior a subequilateral triangle; surface setigerous-punctate. Segment III of tarsi slightly longer than II.

Color, black, moderately polished; apex of head pale; orbits in part, a spot either side on base of vertex, the anterior and lateral margins of pronotum, two dots on its hind margin and apex of scutellum, fulvous; elytra opaque, varied with fuscous and yellowish; a spot at inner angle of clavus, two on middle of corium (one costal), and two at apex of corium with line between them, yellowish; about three approximate spots on base of corium and one on clavus more whitish; veins mostly pale; membrane pale, opaque, heavily veined with fuscous; antennae fuscous; segment I dark testaceous; prosternum and pleurae mostly pale; legs brown, the tibiae and tarsi more fuscous; apex of femora and tibiae yellowish, the latter tipped with black; ventral segments and coxae edged with paler.

Described from one female taken from under kelp on the beach at Puerto Refugio, Angel de la Guardia Island, June 29. This kelp was washed by the high tides when the speci-

men was taken. The genus *Orthophrys* was founded by Dr. Horvath on one species taken under stones between tides on the coast of Morocco. The present species differs from the type only in having the eyes scarcely sinuated, the head scarcely produced in a collum behind the eyes and the hind margin of the pronotum a little concave over the base of the scutellum.

Type: Female, No. 1045, Mus. Calif. Acad. Sci., collected June 29, 1921, on **Angel de la Guardia Island, Gulf of California**.

145. *Pentacora signoreti* Guerin

San Evaristo Bay, June 10; Mulegé, May 14; Loreto, May 19, on sea beach.

146. *Saldula sphacelata* Uhler

Gonzales Bay, April 29; Loreto, May 19, on sea beach; San José Island, June 10, on salt flats.

147. *Saldula interstitialis* Say

Guaymas, April 11, by irrigation ditch; Angeles Bay, May 5, by spring; Mulegé, May 14, along river bank; Loreto, May 19, on sand beach at mouth of river; San Marcos Island, June 19, about spring. This species occurred only where there was fresh water.

148. *Micranthia pusilla* Van Duzee

San Marcos Island, June 19, about water hole near spring.

149. *Buenoa carinata* Champion

Escondido Bay, June 14. Four adults and one nymph were taken by J. C. Chamberlin in a pool at about 1500 feet elevation among the mountains behind the bay. What seems to be the larval form of the same species was taken in a pool on Espiritu Santo Island, June 9.

150. *Ambrysus hybridus* Montondon

Mulegé, May 14. Common with young in Santa Rosalia River in the town where the water was made brackish by the high tides.

151. *Ranatra brevicollis* Montondon

Mulegé, May 14; San Evaristo Bay, June 10. These are immature and the determination is therefore uncertain but they differ in no respect from the young of this species taken about Oakland, California.

152. *Lethocerus annulipes* Herrich-Schæffer

Escondido Bay, June 14. Three examples with young of various instars were taken from a pool in the mountains west of the bay by J. C. Chamberlin.

153. *Gelastocoris variegatus* Guerin

Mulegé, May 14, one example with numerous young found by the Santa Rosalia River.

154. *Ochterus perbosci* Guerin

Mulegé, May 14, one example taken from the river with *Ambrysus hybridus*; San Marcos Island, June 18, one example taken in a pond by J. C. Chamberlin.

155. *Corixa* species

Three examples were taken from a pond near the well at El Candelero, Espiritu Santo Island, June 9.

HOMOPTERA

156. *Tibicen knighti* Davis

San Pedro Bay, Sonora, July 7; San Carlos Bay, Sonora, July 8, 9, not uncommon. They had a short, oft-repeated note and, not being especially wary, were not difficult to capture. This and the following four species were determined by Mr. W. T. Davis of New York.

157. *Tibicen ornea* Walker

San Carlos Bay, Sonora, July 8, one example. This was taken with *T. knighti* which it much resembles and was not recognized as distinct in the field.

158. *Cacama dissimilis* Distant

Ballanda Island, June 9, J. C. Chamberlin. Ballanda Island is a small island about a mile off the western shore of Espiritu Santo Island toward the northern end. This species was not uncommon on the main Island of Espiritu Santo but it was very wary and exceedingly difficult to capture.

159. *Cacama crepitans* Van Duzee

Espiritu Santo Island, May 31; San José Island, May 28.

160. *Okanagodes gracilis* Davis

Smith's Island, Angeles Bay, June 27, J. C. Chamberlin; Pond Island Bay. Angel de la Guardia Island, June 30, July 1. Song a faint sharp chirp like that of a house cricket, but fainter and audible about 75 feet. They usually rested on the bare rocks along the foot of the hills, or on some small weed growing among the rocks.

161. *Clastoptera lineatocollis* Stål

Las Animas Bay, May 8; La Paz, June 3; San Francisco Bay, June 23; Danzante Island, May 24; on Hoffman-isteria.

162. *Clastoptera lineatocollis binotata* Ball

San Francisco Island, May 30, on *Houstonia*; Pond Island Bay, Angel de la Guardia Island, June 30; Puerto Refugio, Angel de la Guardia Island, June 29.

163. *Clastoptera lænata* Fowler

Ceralbo Island, June 6-8; San José Island, June 10.

164. *Stictocephala festina* Say

Mulegé, May 15; Angeles Bay, May 5.

165. *Micrutalis occidentalis* Goding

Ceralbo Island, June 8; San Nicolas Bay, May 16; Freshwater Bay, Tiburon Island, April 23; Monserrate Island, June 13; Guaymas, April 9; Pond Island Bay, Angel de la Guardia Island, July 1; San Lorenzo Island, May 9, June 24; Espiritu Santo Island, June 9; Angeles Bay, May 5.

166. *Vanduzea albifrons* Fowler

Escondido Bay, May 24, one example.

167. *Vanduzea læta* Goding

Guaymas, April 9; Mulegé, May 15; Agua Verde, May 26.

168. *Enchenopa permutata* Van Duzee

Loreto, May 20; Ceralbo Island, June 7, on *Lycium*; San Nicolas Bay, May 16; Puerto Ballandra, Carmen Island, May 22.

169. *Enchenopa minans* Fairmaire

Espiritu Santo Island, May 31, one example.

170. *Leioscyta ferruginipennis testacea* Van Duzee

San Nicolas Bay, May 16; Loreto, May 20; Puerto Ballandra, Carmen Island, May 22.

171. *Hypsoprora simplex* Van Duzee, new species

Allied to *anatima* Fowl., but with the dorsal horn simple and the posterior process bisinuate. Length 5-6 mm., height 4-6 mm. (measured from base of metopidium).

Head as long as wide including eyes, apex truncate, sides sinuate below the eye. Dorsal process suberect, a little compressed laterally, wider and carinate at apex; two lateral carinae obsolete, represented by rows of short spicules; above and below carinate, the dorsal carina con-

tinuous to apex of posterior process and denticulate; dorsal process, viewed from side, parallel on apical two thirds, that portion one third as wide as long; posterior process as wide as dorsal, passing apex of elytra, bisinuate above. Broad costal margin of corium and basal half of clavus and the nervures coriaceous and punctured.

Color, fusco-testaceous, more ferruginous on head, anterior margin of metopidium and beneath, the subhyaline areoles of elytra milky; tip of posterior process sometimes infuscated.

Described from three females: San Nicolas Bay, May 16; Salinas Bay, Carmen Island, June 16.

Type: Female, No. 1046, Mus. Calif. Acad. Sci., collected May 16, 1921, at San Nicolas Bay, Lower California.

172. *Multareis planifrons* Van Duzee, new species

Allied to *cornutus*, but with the front flat, without the prominent lateral tubercle and with the dorsal hump rounded. Length 3.5 to 4 mm.

Face broad, feebly convex, almost even; tubercle below the eye minute, acute, pointing downward, the angle of the cheeks below the tubercle small, acute; surface coarsely obsolete punctate; supra-antennal ledge very feebly sinuated; clypeus less prominent than in *cornutus*. Dorsal prominence of pronotum tumidly convex, in the male sometimes showing indications of a horn either side the carinate median line; surface coarsely punctured, subrugose; posterior process, seen from side, deeply bisinuate, the median hump less abrupt than in *cornutus*. Elytra about as in *cornutus*; base coarsely punctate; apical two thirds very heavily, rugosely reticulate, the disk of the areolets subhyaline. Tibiæ distinctly broader than in *cornutus*.

Color, ferruginous, varied with yellowish; blackish beneath and white pruinose, in the males sometimes almost black; basal third of elytra with a broad yellowish vitta often followed by a blackish cloud; tibiæ with about three pale vittæ indicated.

Described from numerous examples taken on creosote bushes as follows: Gonzales Bay, April 29; Concepcion Bay, June 17; San Marcos Island, June 19; I have taken this species in abundance on creosote bushes at Palm Springs and Coachella, California. The smooth surface and even face will most readily distinguish it.

Type: Male, No. 1047, and *allotype*, female, No. 1048, Mus. Calif. Acad. Sci., collected June 17, 1921, at Coyote Bay, Concepcion Bay, Lower California.

173. *Multareis digitatus* Van Duzee, new species

Allied to *planifrons*, but smaller and more slender with the anterior pronotal hump higher and usually bifurcate. Length 3 to 4 mm.

Face plane as in *planifrons*, the tubercle at lower angle of eye wanting or very minute; outer angle of checks produced in a prominent tubercle, the supra-antennal ledge deeply sinuate as in *cornutus*; clypeus narrower than in either allied species. Anterior pronotal hump higher than in *planifrons*, usually produced in a bluntly conical vertical horn either side the carinate median line; posterior process more slender, broadly sinuated, as seen from the side with a long low prominence above apical half of clavus, its apex acute and a little depressed, not tuberculate as in the allied species. Elytra less strongly rugose at apex, the punctured basal portion less abruptly distinguished, the numerous areolets only subcoriaceous. Tibiæ distinctly flattened but not so wide as in the allied species.

Color, ferruginous yellow, darker on head and beneath, with a darker shade down the exterior face of the dorsal horns; pale area on base of elytra feebly indicated.

Described from one male and six females taken at Guadalupe Point, Concepcion Bay, June 17; Coyote Bay, Concepcion Bay, June 18; one female from Gonzales Bay, April 29; and one female from San Marcos Island, June 19. All were found on creosote bushes. I took paler, immature examples of this species at Palm Springs, California, May 18, 1917, and Prof. H. F. Wickham has sent me others from St. George, Utah.

Type: Male, No. 1049, and *allotype*, female, No. 1050, Mus. Calif. Acad. Sci., collected June 17, 1921, at **Guadalupe Point, Concepcion Bay, Lower California.**

174. *Tylocentrus quadricornis* Funkhauser

Guaymas, April 9, 10; San Carlos Bay, Sonora, July 9; San Pedro Bay, Sonora, July 7; Bay at south end of Tiburon Island, July 4, 5; Larvæ, apparently of this species, were taken on San Marcos Island, May 12. It lives on Mesquite.

175. *Platycentrus brevicornis* Van Duzee, new species

Smaller with shorter horns than *obtusicornis*. Length 5 to 6.5 mm. width across horns 4 mm.

Face about as in *acuticornis*; super antennal ledges moderately sinuate; angle under eye prominent, not acute. Viewed from before the

humeral angles are more acute than in *acuticornis*; horns directed upward and outward in a slight curve, obtuse at apex; viewed from above directed outward, flattened, about half as wide as long and lanceolate at apex; above these horns have two carinae, connecting before the tip, beneath they have one percurrent carina; posterior process longer and narrower than in *acuticornis*, tricarinate, with the apex acute; sides scarcely sinuated near base, in *acuticornis* wider and distinctly sinuated with one carina. Elytra subhyaline, nervures heavy, fuscous; immediate base blackish and punctate. Tibiæ flattened but scarcely expanded.

Color, castaneous brown in male, ferruginous brown in female, with a few pale calloused reticulations; when fresh more or less clothed with white tomentum; tibiæ biannulate with pale; elytra with a nearly obsolete pale vitta beyond the fuscous basal portion; exposed apical teeth of scutellum pale.

Described from a good series of both sexes taken on *Lacodesmus* on San Marcos Island, May 12; Puerto Ballandra, Carmen Island, May 22. I took one male and two females from palo blanco which differ in having the horns longer and the posterior process unicarinate. The species listed by me as *acuticornis* in my Catalogue seems to be that species although smaller than indicated by Stål. It has the horns longer and more erect than appears to be the case with *taurinus* Ball. These may all be forms of one variable species but the more slender posterior process with other minor characters would indicate specific distinction.

Type: Male, No. 1051, and *allotype*, female, No. 1052, Mus. Calif. Acad. Sci., collected May 12, 1921, on San Marcos Island, Gulf of California.

176. *Tylopelta gibbera* Stål

Guaymas, April 11, one example.

177. *Agallia tergata* Van Duzee, new species

Allied to *cinerea*; whitish, tinged with dull fulvous on head and scutellum; tergum black. Length 3 mm., width across elytra 1 1/3 mm.

Vertex about four times as broad as long, a little prominent at middle; pronotum slightly concave behind, very minutely striate; elytra but slightly exceeding the abdomen; front and clypeus broader than in *cinerea*. Last ventral segment of female deeply cleft from lateral angles almost to base, sides near the fundus interrupted by a subacute tooth, narrower and more pointed than in *lyrata* but otherwise very similar.

Valve of male short, transverse; plate long, cylindrical, a little narrower toward the upturned tip; pygofers broad, overlapping the plates at base.

Color, whitish, covered with a white bloom; head, anterior margin of pronotum and scutellum strongly tinged with dull fulvous; rostrum with a black median line; tergum black; venter sometimes marked with black basally; apex of female pygofers and suture of the male plates at times blackened; wings with fuscous nervures; claws black.

Described from eight examples taken on *Encelia* on Tortuga Island, May 11, and one from San Marcos Island, May 12. The immaculate yellowish white color above and form of the genitalia will distinguish this from any previously described species. The black tergum imparts a soiled appearance to the elytra.

Type: Female, No. 1053, and *allotype*, male, No. 1054, Mus. Calif. Acad. Sci., collected May 11, 1921, on Tortuga Island, Gulf of California.

178. *Idiocerus verticis* Say

La Paz, June 3; one immature female that seems to belong here.

179. *Bythoscopus robustus* Uhler

Loreto, May 20; Mulegé, May 15; San Marcos Island, June 19.

180. *Homalodisca liturata* Ball

Guaymas, April 9-11; Mulegé, May 15; Loreto, May 19; San Francisquito Bay, May 10; La Paz, June 5.

181. *Dræculacephala acuta* Walker

Mulegé, May 14; San Carlos Bay, July 9.

182. *Dræculacephala reticulata* Signoret

Mulegé, May 14.

183. *Gypona incita* Van Duzee, new species

Allied to *irrorata* Stål but with longer and more angled vertex. Length 10 mm.

Female: Pale testaceous brown, tinged with fulvous on vertex and scutellum and less strongly so on pronotum; two dots on base of vertex behind ocelli, basal margin of front, a few irregular marks on anterior submargin of pronotum and large basal angles of scutellum black; vertex with a few fuscous punctures and clouds next the eyes and along anterior margin; median line pale on basal two-thirds. Pronotum strongly, transversely rugose and fusco-irrorate; broad anterior and lateral margins irregularly striate and varied with fuscous or black, median line slenderly pale. Disk of scutellum faintly clouded. Elytral veins pale, bordered with fuscous punctures to near apex, the areoles marmorate with fuscous brown, darker toward apex. Wings brown with darker veins. Front and inner field of cheeks yellowish with faint striæ on front, its base blackish and deeply impressed; clypeus scarcely longer than wide, sides strongly arcuate; disk of loræ and clypeus touched with brown. Segment I of antennæ pale; II black, polished; seta brown. Beneath pallid, sides of pleuræ, apex of femora and exterior face of intermediate and hind tibiæ blackish; abdomen and hind tarsi tinged with red. Last ventral segment twice as long as preceding, trisinate at apex, median lobe broad, truncate, equalling lateral lobes.

In this species the vertex is distinctly more than half the length of the pronotum and about a sixth narrower, the ocelli are pale, placed obviously behind the middle of the vertex and at equal distances from median line and hind margin. It pertains to section LL of Spångberg. *Gypona atillana* Fowler has a much narrower and more pointed head. Described from the unique type.

Type: Female, No. 1055, Mus. Calif. Acad. Sci., collected April 10, 1921, at Guaymas, Sonora, Mexico.

184. *Gypona moneta* Van Duzee, new species

Related to *cinerca* Uhler, but narrower with longer head. Length 7 mm.

Female: Cinereous, tinged with yellow on head, pronotum and scutellum. Vertex flat, depressed before apex; two thirds as long as wide at anterior angles of eyes, obscurely rugose. Ocelli fulvous, as distant from one another as from eyes and a third more than from hind margin of vertex; hind edge with a black point just exterior to line of ocelli; front narrow, strongly convex as in *cinerca*, the antennal sockets distant from eyes; clypeus slightly narrowed before apex; cheeks strongly angled and sinuated below, dotted with black points. Pronotum yellowish anteriorly, cinereous and transversely striate and minutely fusco-punctate posteriorly, the hind edge with coarser black dots, confluent in places. Scutellum brownish, with minute, nearly obsolete, fuscous punctures and an obscure paler area either side the middle. Elytra whitish, areoles with a few blackish marks and bordered with fuscous punctures; usually with a large black spot on discal transverse vein of

corium; the costal areole yellowish, immaculate except for marginal punctures. Beneath varied with fuscous; venter obscurely dotted, with a black vitta either side; the genital segment strongly dotted. Pygofer with a short black median line, a slender dash beyond this and a similar one on each segment of connexivum. Femora dotted, with a subapical black annulus indicated; tibial spines ferruginous. Last ventral segment twice longer than preceding, trisinnate, the median lobe equalling the sides and subtruncate.

Described from three females taken at San Carlos Bay. In the subgenus *Prairiana* this form is quite distinct by its long vertex, the black points on basal margin of pronotum, whitish elytra with yellowish costa and the black markings on the venter.

Type: Female, No. 1056, Mus. Calif. Acad. Sci., collected July 9, 1921, at San Carlos Bay, Sonora, Mexico.

185. *Gypona candida* Van Duzee, new species

Pale yellowish white; elytra with ramose brown lines in the areoles. Length 7 mm.

Head sublaterally rounded before. Vertex nearly twice as long on median line as next the eyes, sloping, not transversely depressed; passage to front obtuse, rounded; ocelli very large, blackish, placed half way between median line and eyes, a little before the middle; surface of vertex smooth, without striæ or punctures. Pronotum finely striate, anterior and lateral margins broadly smooth. Scutellum smooth. Elytra without reticulate venation but all areoles with sparse ramose brown lines. Front very broad, smooth, with lateral striæ nearly obsolete; sides of clypeus slightly arcuate. Last ventral segment of male three times as long as preceding, subconical, rounded at apex; plates twice longer than broad, larger than valve, surpassing apex of pygofer; styles slender, regularly tapering from base to the very acute, outwardly curving tips which lie just under the apices of the plates.

Color, nearly white, tinged with yellow on head and anterior margin of pronotum, and almost imperceptibly with green on elytra; two large dots on hind edge of vertex behind the ocelli and one on base of clavus black; two small fuscous dots on pronotum behind each eye; disk of pronotum sparsely, minutely dotted with brown; veins, ramose lines and a dash on base of membrane brown; abdomen light greenish yellow.

Described from two males taken at Puerto Ballandra, Carmen Island, May 21, on a mint-like plant. Among the species with short blunt head this may be distinguished by its white color and the conically produced last ventral segment of male.

Type: Male, No. 1057, Mus. Calif. Acad. Sci., collected May 21, 1921, at Puerto Ballandra, Carmen Island, Gulf of California.

186. *Gypona annulicornis* Van Duzee, new species

Apparently allied to *delicata* Fowler: Pale greenish, the elytra whitish with the veins and ramose lines in the areoles greenish; second antennal segment polished black. Length 8 mm.

Head subangularly rounded, compressed and foliaceous anteriorly with the edge reflexed; median length twice that at eye; transverse striæ minute, becoming oblique between the ocelli; median incised line obsolete before apex; ocelli large, pink, placed midway from median line to eye and about equidistant from hind and front margins of vertex. Pronotum feebly striate; latero-anterior margins a little longer than latero-posterior. Front oval, moderately convex, scarcely striate; sides of clypeus rectilinear, parallel. Last ventral segment of male a little longer than preceding, truncate, the angles rounded; plates long, narrow, sides parallel, apex oblique, attaining apex of pygofers.

Color, pale yellowish green, varied with dark in places, the posterior disk of pronotum punctate with green; elytra whitish, the veins and ramose lines in all areoles greenish, the narrow costa and membrane whitish; beneath paler, the hind tibiae and cheeks greener; second antennal segment conspicuously polished black, seta brown; edge of head with a slender geminate brown line, making it appear canaliculate when seen from before.

The ramose green lines in the areoles give this species the aspect of *cana* but it is a true *Gypona* by Dr. Ball's arrangement of 1920. The clavus is somewhat thickened and obscurely punctate at base. The black antennal segment and form of the male plates are distinctive. Described from the unique type.

Type: Male, No. 1058, Mus. Calif. Acad. Sci., collected May 29, 1921, on San José Island, Gulf of California.

187. *Gypona angulata* Spångberg

Mulegé, May 15; San Carlos Bay, July 9.

188. *Spangbergiella mexicana* Baker

Mulegé, May 14, 15; San Carlos Bay, July 9.

189. *Aligia amœna* Van Duzee, new species

Aspect and size of *Phlepsius utahmus* Ball, paler with a shorter vertex. Length 4 mm.

Vertex a third wider than long, obtusely angulate before; surface depressed at base; anterior edge rounded to front; front twice longer than wide, quite regularly tapering to apex; clypeus widening from base to near apex. Last ventral segment of female broadly, subangularly but shallowly excavated. Male valve short, rounded; plates broad-triangular; on median suture nearly twice longer than valve.

Color, pale yellowish, sometimes tinged with fulvous next the eyes and on the scutellum and base of front; vertex with four dots on anterior submargin, a group of vermiculate lines either side on disk and two dots on hind edge, fuscous; median incised line on basal two thirds black; ocelli usually fuscous; pronotum whitish, minutely and sparsely inscribed with brown and showing five faint longitudinal lines; anterior submargin with a row of about eight brown points; basal angles of scutellum and short transverse impressed line and sometimes two dots at apex and two near base, blackish; elytra white; veins slender, brown, costa pinkish; areoles sparsely inscribed or dotted with brown; front yellow with base more dusky and median line usually pale, sometimes with an irrorate band between the antennæ and four dots on margin of cheeks fuscous; pleural pieces largely black; base of venter or a median vitta black; legs white, lightly dotted with brown; hind femora immaculate except for two or three setigerous points near their apex, and two subapical annuli; female oviduct and male plates with a brown line.

Described from numerous specimens taken as follows: Loreto, May 20, on *Lycium richii*; San Nicolas Bay, May 16; Ceralbo Island, June 7, on *Lycium richii*; Agua Verde, May 26, on *Lycium richii*. The pattern of marking on vertex etc. seems to be very similar in *Phlepsius utahnus* Ball but other characters are very distinct. At San Diego, California, I took what seems to be this same species. These specimens were, however, more clearly marked, with the vertex slightly more pointed.

Type: Female, No. 1059, and *allotype*, male, No. 1060, Mus. Calif. Acad. Sci., collected June 7, 1921, on Ceralbo Island, Gulf of California.

190. *Scaphoideus neglectus* Osborn

San Carlos Bay, Sonora, July 9.

191. *Scaphoideus consors* Uhler

Angeles Bay, May 4.

192. *Platymetopius hymenocleæ* Van Duzee, new species

Closely allied to *nigriviridis* Ball, but paler with strongly produced last ventral segment and white band across base of front. Length 4 mm.

Vertex longer than in *nigriviridis*, its width between the eyes two fifths the median length. Last ventral segment of female produced at middle for about a third its length beyond the lateral angles. Valve of male long and conically rounded at apex; plates long-triangular, about as long as valve and subacute at apex.

Color, of head pale yellow; vertex with broken, longitudinal, crenulate fuscous lines, omitting the median line and a broader one either side, the markings becoming obsolete posteriorly; face deeper yellow, apex of front with fuscous lineations carrying a broad transverse white band, connecting with tip of vertex by a slender longitudinal line and below with a segment of the angled pale line often seen in allied species; eyes castaneous. Pronotum whitish, tinged with green anteriorly, very faintly irrorate, with a pale longitudinal vitta behind the eye indicated; scutellum yellowish with darker basal angles. Elytra white with a broad fuscous vitta indicated along the outer margin of clavus and traces of vitta on corium as in *nigriviridis*; apex of elytra faintly infuscated, with the edge white and white spots along the transverse veins, and about four or five oblique fuscous veins next the costa; inner angle with a small fuscous point; beneath pale yellow, base of venter blackish in female.

Described from one male and three female examples taken on *Hymenoclea salsola* at Puerto Refugio, Angel de la Guardia Island, May 1, and one male from the same plant on Mejia Island, April 30. The male genital characters seem to be about the same as those of *nigriviridis* and the color pattern is about the same except for the pale colors and white vitta on base of front. The strongly produced female ventral segment indicates good specific distinction.

Type: Male, No. 1061, Mus. Calif. Acad. Sci., collected April 30, 1921, on Mejia Island, Gulf of California. Allotype, female, No. 1062, collected May 1, 1921, at Puerto Refugio, Angel de la Guardia Island, Gulf of California.

193. *Platymetopius torridus* Ball

Guadalupe Point, Concepcion Bay, June 17; San Marcos Island, June 19; Gonzales Bay, April 29, common on creosote bush. I have this same species from Kelso, San Bernardino Co., California. It is a good species, quite distinct from *brevis*.

194. *Platymetopius jocosus* Van Duzee, new species

Form and size of *torridus* nearly; dark red, elytra white with fuscous apex. Length 3.5 mm.

Vertex bluntly angled, as long as wide between the eyes, longitudinally depressed; front strongly transversely convex, sides nearly parallel to near apex, sutures indistinct; clypeus a little wider at apex. Last ventral segment of female briefly produced at middle. Elytral venation weak, about eight oblique veins in costal areole more distinct.

Color, dull dark red, scarcely mottled, paler on scutellum; elytra white, veins faintly lined with brown, reticulations nearly obsolete; costa touched with red; apex covered by an irrorate fuscous cloud reaching two thirds to the transverse veins; tergum largely black, the pleuræ partly infuscated.

The short vertex and very simple, striking coloration of this species will at once distinguish it. Described from the unique type.

Type: Female, No. 1063, Mus. Calif. Acad. Sci., collected June 8, 1921, on *Lacodesmia* on Ceralbo Island, Gulf of California.

195. *Platymetopius irroratus* Van Duzee

San Pedro Martir Island, April 18, abundant on vines of *Vaseyanthus insularis*; San José Island, May 28; Mulegé, May 15; Ceralbo Island, June 8.

196. *Platymetopius speciosus* Van Duzee, new species

Allied to *brevis*; strongly marked with black and white; elytra with base, a median annulus and apical spot white; scutellum partly orange; face pale yellow, irrorate between eyes. Length 3 mm.

Vertex nearly twice longer than wide between the eyes, apex a little sharper than a right angle; median line depressed. Last ventral segment of female broad triangular, slightly sinuated either side the blunt median point. Valve of male broadly rounded at apex, the triangular plates equalling the pygofers, obtuse at apex.

Color, vertex white; a broad angulate transverse black vitta just before the eyes, composed of approximate longitudinal lines; two minute dashes either side the apex and three longitudinal lines connecting them with the transverse vitta; base of vertex sometimes tinged with fuscous, with two minute black dots on hind edge. Pronotum black, irrorate with white, forming a transverse vitta between the eyes and a short longitudinal line behind the eyes. Scutellum fulvous or almost salmon

pink, basal angles and usually some dots near apex and median line at base black. Elytra ivory white, heavily inscribed with fuscous or black, when closed showing a trilobate basal vitta on clavus, large annulus on middle of commissure, a large angular spot at its apex and about six oval or round spots on disk, white; costa mostly white with ten or twelve oblique veins. Beneath deep black, sometimes with a blue bloom; face white, sparsely irrorate between the antennæ and at base; tibiæ and tarsi white, heavily dotted with black.

Described from one male and three female examples: Ceralbo Island, June 8; San José Island, May 29; Puerto Ballandra, Carmen Island, May 21; Espiritu Santo Island, May 31. This strikingly marked species is very distinct from anything previously known.

Type: Female, No. 1064, Mus. Calif. Acad. Sci., collected June 8, 1921, on Ceralbo Island, Gulf of California. *Allotype*, male, No. 1065, collected May 29, 1921, on San José Island, Gulf of California.

197. *Platymetopius scutellatus* Van Duzee, new species

Closely allied to *speciosus*, but without the large white markings on the elytra and with the scutellum conspicuously orange. Length 3 mm.

Vertex but slightly longer on median line than wide between the eyes, depressed before the tip which forms about a right angle; front narrow, sides almost rectilinear at apex, transversely less convex than in *speciosus*; clypeus slightly widened from near its base. Last ventral segment of female truncate and very feebly sinuate, the lateral angles and middle slightly produced. Valve of male distinctly but very obtusely angled, the valve subacute, about as in *speciosus*.

Color blackish fuscous; vertex yellowish, marked with fuscous as in *speciosus* but more diffusely; pronotum irrorate with white, with five longitudinal pale lines distinct; scutellum orange, basal angles, a mark before the apex and two dots near the base fuscous; elytra white with strong fuscous vermiculations, giving them a blackish aspect, round white spots large and conspicuous, especially two on the commissure; oblique costal veins somewhat obscured by the fuscous vermiculations; wings faintly smoky with heavy fuscous veins. Face pale ochre-yellow, minutely dusted with darker on the front and about the eyes, the median line obscurely paler; beneath and legs varied with paler; tibiæ largely pale, strongly dotted.

Described from one pair taken on *Laccodesmia* on San Marcos Island.

Type: Female, No. 1066, and *allotype*, male, No. 1067, Mus. Calif. Acad. Sci., collected May 12, 1921, on San Marcos Island, Gulf of California.

198. *Platymetopius analis* Van Duzee, new species

A small white species dotted with fuscous with yellow scutellum and fulvous head. Length 3.5 mm.

Vertex but slightly longer than wide between eyes, about right angled at the obtuse, upturned apex; front narrow as in *scutellatus*, a little narrower at apex; clypeus much widened at apex. Last ventral segment of female slightly produced either side of a small acute median notch, the lateral angles produced in a rounded lobe.

Color, head pale fulvous yellow, tinged with brown about eyes and becoming yellow at apex and on front and clypeus; outer area of cheeks and base of front with a few minute scattering brown dots; scutellum clear yellow, darkened at basal angles; pronotum and elytra white, irregularly dotted with small brown points; commissure with two pairs of black points beyond the clavus; beneath varied with white and yellow, with a few brown clouds about base of coxæ.

Described from one female taken on palo tinto (*Olneya tesota*) on Catalina Island.

Type: Female, No. 1068, Mus. Calif. Acad. Sci., collected June 12, 1921, on Catalina Island, Gulf of California.

199. *Deltocephalus flavicosta* Stål

Mulegé, May 14, 15; San Carlos Bay, Sonora, July 9. These are of the large pale form found in the West Indies and South America.

200. *Deltocephalus sonorus* Ball

Mulegé, May 15.

201. *Deltocephalus contrerasi* Van Duzee, new species

A large species strongly marked with fuscous brown and pale. Length 4 mm.

Vertex a third wider than long, obtusely angled at apex; surface flat, broadly rounded to front. Pronotum slightly longer than vertex. Elytra with several false veins, especially in clavus and toward apex of corium. Front moderately broad, rounded at base, the sides straight below antennæ, not incurved to base of clypeus; clypeus nearly twice longer than wide, scarcely wider at apex, sides straight. Ultimate ventral segment of female sinuately narrowed, with apical margin a little produced on middle; valve of male short-triangular; plates about three times as long as valve, acute and upturned at apex.

Color, vertex and anterior margin of pronotum brownish yellow, the former with abbreviated median incised line black; two oblique dashes at

apex and four oval spots on disk brownish, the posterior pair of spots oblique. Face brownish yellow; front with a few brown arcs at base and the suture below black. Pronotum gray, more or less tinged with yellow, with about five pale longitudinal lines indicated, and four blackish spots near anterior margin. Scutellum more or less fulvous; small basal angles, two dots near base and a cloud before apex brownish or black. Elytra fuscous, varied with paler and marked with vermiculate white veins, especially on clavus; on corium sometimes indicating two transverse vittæ, one near middle, the other at apex of clavus, the latter more obvious on costa; inner three apical arcoles carrying large discal whitish hyaline spots. Pluræ and abdomen mostly black, margined with fulvous. Legs pale, anterior and intermediate femora with sub-apical annulus, the former black at base.

Described from 11 examples swept from grasses about a saltwater lagoon at Tepoca Bay, Sonora. I take pleasure in naming this large, clearly marked species for Señor Francisco Contreras, conchologist and director of the Mexican National Museum, and a most welcome addition to our small exploring party.

Type: Female, No. 1069, and *allotype*, male, No. 1070, Mus. Calif. Acad. Sci., collected April 25, 1921, at Tepoca Bay, Sonora, Mexico.

202. *Lonatura ventralis* Van Duzee, new species

Yellowish testaceous varied with brownish; venter of male deep black, female greatly attenuated behind. Length, male, 3 mm., female, 5 mm.

Vertex as long as wide between the eyes, about right-angled before; passage to front rounded; surface feebly convex; hind margin very feebly arcuated; front nearly as wide as long, base strongly angled, sides feebly convex below antennæ; clypeus long, slightly narrower at apex, sides straight. Pronotum shorter than vertex, covering most of scutellum and base of elytra. Elytra attaining middle of second tergal segment: venation prominent, irregular, entire costal margin occupied by a broad costal arcole. Last ventral segment of female feebly trisinate, the median lobe short-triangular; pygofers exceeding last tergal segment by half their length and itself exceeded by the oviduct for a similar space. Valve of male small, triangular; plates narrowly triangular, their subacute apices equalling the pygofers.

Color, a dingy brownish or testaceous yellow; apex of vertex with a pair of brown oblique marks, behind these a pair of irregular spots and farther back a pair of oblique marks pale brown, these leave a branched median vitta bisected by the incised median line; pronotum with five pale longitudinal vittæ indicated; scutellum yellow; elytra dusky hyaline with pale nervures; tergum more yellow with five rows of pale obscure spots, the median row linear; front brown with arcs

and median line below pale and distinct; cheeks, loræ and clypeus somewhat clouded; venter deep black in male, edged with yellow, in female brownish with hind edge of segments pale.

Described from numerous examples taken on a fine grass (*Monanthoclea*) growing about a salt marsh on the point at Tepoca Bay.

Type: Female, No. 1071, and *allotype*, male, No. 1072, Mus. Calif. Acad. Sci., collected April 25, 1921, at **Tepoca Bay, Sonora, Mexico.**

203. *Lonatura nana* Van Duzee, new species

Differs from *minor* Van D. in its flatter and more pointed vertex and almost uniformly testaceous white color. Length 2.5 to 3 mm.

Vertex about a fourth wider between the eyes than long on median line, obtusely angled before but less rounded than in *minor*; disk more flattened with the passage to the front more rounded. Elytra short, attaining apex of fourth tergal segment in male, middle of third in female. Last ventral segment of female short, rounded; plates broad-triangular, sides rectilinear, apex equalling pygofers.

Color, testaceous-white tinged with yellow, especially on the head, the front pale fulvous with median line and arcs paler; two dots on base of vertex behind the ocelli and a pair of minute points at apex brown; apex of clypeus with a fuscous spot; antennal cavities, rostrum, ovipositor of female and the metasternum and base of abdomen black; subapical annulus on femora and tibial spines and dots pale brown.

Described from four male and 12 female examples swept from *Monanthoclea* on San Francisco Island. Any of the markings mentioned except the black ovipositor may be modified or wanting.

Type: Female, No. 1073, and *allotype*, male, No. 1074, Mus. Calif. Acad. Sci., collected May 30, 1921, on **San Francisco Island, Gulf of California.**

204. *Euscelis exitiosus* Uhler

Mulegé, May 14, 15. These, especially the males, are unusually dark, much as I found them in Jamaica.

205. *Euscelis bicolor* Van Duzee

San Carlos Bay, Sonora, July 9, three examples.

206. *Eutettix coronatus* Ball

Angeles Bay, May 5; Ceralbo Island, June 7. One male only shows the black marks on the vertex, pronotum and scutellum and the basal ones on the elytra. Those on the commissure at apex of clavus and two costal placed at either end of the postnodal areole seem to be persistent. I would consider this a distinct species.

207. *Eutettix tenellus* Baker

Isla Raza, April 21, abundant on *Atriplex*; Isla Raza, May 4, on *Salicornia*; Santa Inez Island, May 13, on *Atriplex* and *Chenopodium* where growing together rankly in masses; Ceralbo Island, June 7, on *Sesuvium*. Here they were larger and mostly pink in color, greatly resembling, although distinct from, *rubicundulus* Van Duzee from Jamaica.

208. *Eutettix pulchellus* Ball

Puerto Refugio, Angel de la Guardia Island, May 1, one male.

209. *Eutettix strictus* Ball

Loreto, May 19. The two females taken seem to agree very well with Dr. Ball's description but in one there is a pair of conspicuous black dots placed immediately above the ocelli, a similar pair occupying the outer angles of the pronotum behind the eyes, two minute brown points on the vertex anteriorly and two on the margins of the scutellum a little before the apex; in both there is a pair of pale brown spots on the commissure just before the apex of the claval nervures.

210. *Phlepsius superbus* Van Duzee

Guaymas, April 11, one female.

211. *Phlepsius docilis* Van Duzee, new species

Aspect of *truncatus*, but with more pointed vertex and narrower vertex and front. Length 5 mm.

Head wider than pronotum; vertex flat, subacutely angled before, its median length three fourths its basal width; pronotum a half longer than vertex, semicircularly rounded before; elytra rather narrow, about as in *truncatus*; ocelli large, fuscous, placed their own width from the eyes; front narrow, its width but little more than half the length, sides parallel above antennæ, regularly narrowing below to clypeus. Clypeus much widened below to its rounded apex. Last ventral segment of female very feebly arcuated across nearly its whole width.

Color, about as in *truncatus*; reticulations on vertex omitting the base, apex and median vitta; apex with a black dash either side, enclosing a pinkish apical spot, another pinkish spot at base either side of the short black incised median line; pronotum with five faint whitish longitudinal vittæ; scutellum scarcely marked; elytral reticulations rather close; commissural margin whitish with two pairs of inconspicuous white spots, ocellate with pink; face pale, faintly irrorate with a paler median vitta; outer edge of cheeks with a black point; last ventral segment with a blackish vitta, continued along the oviduct. Described from the unique type.

Type: Female, No. 1075, Mus. Calif. Acad. Sci., collected May 20, 1921, at Loreto, Lower California.

212. *Phlepsius argillaceus* Van Duzee, new species

Allied to *excultus*, narrow, with vertex longer and pronotum more produced between the eyes. Length 5 mm.

Male: Head a little narrower than pronotum; vertex a third wider than its median length, well produced in an obtuse right-angle; passage to front sharper than in *excultus*; eyes as long as width of vertex. Pronotum nearly twice as wide as its median length; strongly advanced but scarcely angled anteriorly; latero-anterior margins a little shorter than latero-posterior and continuing the curvature of the anterior margin with scarcely a break; transverse striæ obscure. Front flattened above, a half longer than broad; clypeus widened to the feebly emarginate apex. Genitalia about as in *excultus*. Valve broader, plates shorter and broader, about three times as long as valve; pygofers exceeding plates by length of valve.

Color dull clay yellow inscribed with brown; base of vertex and apex of scutellum nearly free; two spots near base of vertex, irregular clouds along outer margin of pronotum and intra-basal spots on scutellum pale fuscous; elytra evenly infuscated; transverse ulnar and apex of claval nervures black; whitish commissural vitta indistinct, broken by the two black claval nervures; face dark, irrorate with paler with a pale basal spot on apex of head. Described from the unique type.

Type: Male, No. 1076, Mus. Calif. Acad. Sci., collected June 14, 1921, at Escondido Bay, Lower California.

213. *Acinopterus acuminatus* Van Duzee

Isla Raza, April 21, May 4, on *Sesuvium*; Mulegé, May 15; Loreto, May 20; Puerto Ballandra, Carmen Island, May 21, 22; Ceralbo Island, June 7, on *Sesuvium*.

214. *Acinopterus acuminatus viridis* Ball

Puerto Refugio, Angel de la Guardia Island, May 1; Coronados Island, May 18, on *Atamisquaca emarginata*; Puerto Ballandra, Carmen Island, May 22; Marquer Bay, Carmen Island, May 22; Mulegé, May 14.

215. *Neocoelidia pallida* Baker

San Lorenzo Island, May 9, on *Houstonia*; Espiritu Santo Island, May 31; Puerto Ballandra, Carmen Island, May 21; Salinas Bay, Carmen Island, June 16; Escondido Bay, May 24; Loreto, May 19. These are of a stronger yellow color than are Californian specimens but do not seem to differ otherwise.

216. *Protalebra scriptozona* Van Duzee, new species

Allied to *brasiliensis*, but larger with shorter vertex; yellowish white, pronotum, basal and apical thirds of elytra milk white, inscribed with red, the median third greenish yellow. Length 3.5 mm.

Head very large, slightly wider than pronotum. Vertex rounding over almost from its base, widened apically, at base two thirds as wide as its median length, base subangularly but feebly emarginate; pronotum a fourth longer than vertex; hind margin broadly concave; venation of wing almost as in *brasiliensis*. Front strongly convex, broader than in *brasiliensis*, tapering rapidly to the narrow clypeus. Last ventral segment of female long, produced in an obtuse angle; plates of male small, abruptly tapering to long parallel points which form fully half the length of the valve.

Color, ivory white; vertex with a clear yellow transverse band, more or less evident; pronotum milk white; two large spots on anterior submargin, two smaller near humeral angles and a minute median point on hind margin orange; scutellum with three large orange spots placed at the angles, the extreme acuminate tip white; elytra milk-white with median third greenish yellow bordered either side with ivory white; the basal milk-white portion with about three irregular orange red spots, the apical third with orange red veins, apical margin quite broadly fuscous and a narrow broken fuscous line separates the milk-white from

the ivory-white portions; prosternum and abdomen black, the segments slenderly edged with yellow, in the female broadly whitish; ovipositor of female castaneous, the pygofers somewhat infuscated.

Described from one male from Puerto Ballandra, Carmen Island, May 21; one female from Ceralbo Island, June 8, and one female from Espiritu Santo Island, May 31.

Type: Female, No. 1077, Mus. Calif. Acad. Sci., collected June 8, 1921, on Ceralbo Island, Gulf of California. *Allotype*, male, No. 1078, collected May 21, 1921, at Puerto Ballandra, Carmen Island, Gulf of California.

217. *Empoasca viridescens* Walsh

San Pedro Martir Island, April 18; Mulegé, May 15.

218. *Empoasca alboscripta* Van Duzee

Mulegé, May 15.

219. *Scolopsella reticulata* Ball

Ceralbo Island, June 8; San Marcos Island, May 12, on *Laccodesmia* with young; Salinas Bay, Carmen Island, June 16, young; Bay at south end of Tiburon Island, July 5, small larvæ; Puerto Ballandra, Carmen Island, May 21, very small larvæ.

220. *Cyrpoptus nebeculosus* Stål

San Carlos Bay, Sonora, July 8, two examples.

221. *Ticida chamberlini* Van Duzee, new species

Size and aspect of *Orgcrius rhyparus*, but with a short transverse vertex; testaceous brown varied with darker. Length 6 mm.

Greatest length of head two thirds its width across the eyes; vertex smooth, transverse, its median length one third its width; apical half raised nearly at right angles to the basal; base straight; anterior margin obtusely advanced; base of front reflexed and superior for a distance greater than length of vertex; median compartment of front smooth with heavy median and lateral carinæ; lateral compartments with two rows of variolæ which become four or five on the reflexed superior base; apex of head smooth, ecarinate, sides vertically raised above the

eyes; clypeus simple, tricarinate. Pronotum abruptly advanced between the eyes, with a high median carina; entire anterior edge of pronotum sharply carinate, surface deeply pitted. Scutellum twice as wide as long, sharply tricarinate, the basal areas pitted, the median compartment with a single pit behind the middle. Elytra short, transverse, oval, closely reticulate-veined; tergal segments with six to eight pits either side near hind margin. Rostrum surpassing abdomen by nearly the length of last segment; propleuræ with two rows of pits posteriorly.

Color, testaceous-brown, obscurely varied with darker; pits and elytra fuscous brown, the venation of the latter pale apically; clypeus tinged with ferruginous; beneath and legs pale, a subapical annulus on femora and base and narrow apex of tibiæ fuscous; spines of hind tibiæ and tarsi black.

Described from three females taken by Mr. J. C. Chamberlin; two at Palm Cañon, Angel de la Guardia Island, May 3, and one at Puerto Refugio, Angel de la Guardia Island, May 1.

Type: Female, No. 1079, Mus. Calif. Acad. Sci., collected May 1, 1921, at Puerto Refugio, Angel de la Guardia Island, Gulf of California.

222. *Bothriocera tinealis* Burmeister

Escondido Bay, June 1, J. C. Chamberlin. This specimen is intermediate in color between the typical form and the pale variety *westwoodi*.

223. *Oliarus excelsus* Fowler

Escondido Bay, May 24; San Lorenzo Island, May 9; Cer-albo Island, June 8; Palm Cañon, Angel de la Guardia Island, May 3. These agree very closely with Fowler's figure and brief description and undoubtedly pertain to that species.

224. *Oliarus franciscanus* Stål

San Esteban Island, April 19; Santa Cruz Island, May 13; Gonzales Bay, April 29; Isla Raza, April 21; San Lorenzo Island, May 9; on Houstonia; San Marcos Island, June 19; Mulegá, May 15; San Francisco Island, May 30, on Salicornia; Escondido Bay, June 14.

NYMPHOCIXIA Van Duzee, new genus

Allied to *Æcleus*, the vertex confused with the front, without a transverse carina, and extended at base so as to cover the middle of the pronotum, the mesonotum tricarinate.

Vertex narrow, nearly parallel, confounded with the front in a common convexity, its base produced back to cover the middle of the pronotum and feebly angularly emarginate; vertex, front and clypeus with three percurrent carinæ, the lateral greatly elevated, vertical above, widely oblique below; front widened to apex, median ocellus distinct; earinæ low on the clypeus. Eyes emarginate below. Antennæ small, placed at the sinus of the eyes, segment II not longer than wide. Pronotum deeply angularly excavated behind; passing entirely under the shelving base of the vertex between lateral carinæ; mesonotum tricarinate. Elytra longer than in *Æcleus*; nervures punctate, radial and ulnar contiguous at base but not fused, connected by a transverse vein; radial forked just beyond middle; outer ulnar forked nearer the transverse veins; stigma broad, the veins beyond it curved; hind tibiæ unarmed. Type of genus, *Nymphocixia unipunctata* Van Duzee, n. sp.

This genus is really nearer to *Æclidius* than to *Æcleus* but the front has a median carina, the lateral carinæ are much higher, the vertex is produced over the pronotum and the elytral venation is different.

225. *Nymphocixia unipunctata* Van Duzee, new species

Testaceous white varied with fuscous with a round black dot on sixth apical areole. Length 5 mm.

Head whitish, front fuscous when mature, the carinæ whitish edged with brown; the carinæ and hind margin of pronotum brown; mesonotum brown, tip white, carinæ fuscous. Elytra whitish hyaline with fuscous nervures; a fuscous V rests on the transverse nervures, covering the areole between the two main branches of the ulnar nervure, with one end resting on the costal margin the other covering apex of clavus and sometimes clouding the entire outer claval area to its base; stigma black, surrounded by a yellowish cloud with a clearer oblique white vitta before it; apex beyond transverse nervures mostly fuscous with about five exterior areoles and a spot against the transverse nervures white; near the inner angle with a round black spot; nervures of wing brown; beneath and legs nearly white; abdomen mostly black; tips of tibial and tarsal spines black. Immature examples are paler or even fulvo-testaceous varied with white but all show the characteristic elytral markings.

Described from five male and nine female examples found resting on the foliage of *Avicennia nitida* growing about the lagoon at the pearl factory on Espiritu Santo Island. These bushes were growing with mangroves where they were surrounded by water at high tide.

Type: Male, No. 1080, and *allotype*, female, No. 1081, Mus. Calif. Acad. Sci., collected June 1, 1921, on Espiritu Santo Island, Gulf of California.

226. *Æclidius nanus* Van Duzee

Angeles Bay, June 27; San Lorenzo Island, May 9; Cer-albo Island, June 7, on Lycium; Tortuga Island, June 22. *Bri-via fulgida* Van D. and *Bri-via fuscus* Van D. from Jamaica belong to this genus.

227. *Æclidius fraternus* Van Duzee, new species

Allied to *fuscus* Van D., but darker colored with thicker antennæ. Length 5 mm.

Vertex and front a little wider than in *fuscus*, the carinate sides of the front broader and more sloping outward. Second antennal segment a half longer than thick, its thickness equal to greatest length of pronotum behind the eye. Rostrum attaining middle of fourth segment of venter. Pronotum short, either side of median carina as long as width of vertex. Mesonotum shorter than in *fuscus*, equal to width of head across the eyes. Elytra one third narrower than in the allied species.

Color, fusco-castaneous, the margins, tip and carinæ of mesonotum fulvous; carinæ of head white, broadly black before the eyes and slenderly edged with brown; pronotum brown, the carinæ broadly whitish; abdomen and body beneath varied with paler; legs fuscous; tibiæ paler, knees whitish; elytra and wings whitish hyaline, the nervures strong, fuscous, impunctate.

Described from one damaged male taken at San Carlos Bay.

Type: Male, No. 1082, Mus. Calif. Acad. Sci., collected July 9, 1921, at San Carlos Bay, Sonora, Mexico.

228. *Æcleus decens* Stål

Guaymas, April 11. The single example taken agrees entirely with Fowler's description and figure of *decens* but his figure of the male genital segment is purely diagrammatic and does not show the specific characters which are well brought out in the description.

229. *Æcleus monilipennis* Van Duzee, new species

Very close to *fulvidorsum* Ball, but with the elytral veins strongly dotted throughout and different male genitalia. Length 4.5 to 5 mm.

Dull fulvous; mesonotum sometimes marked with black; pronotum and legs more testaceous; clytra whitish hyaline, the margins distinctly and somewhat remotely dotted with black throughout, the marginal only pale, the apical marked with fuscous next the margin; commissure with two short fuscous lines. Abdomen largely black above and partly so below, especially in the male; clypeus with a fuscous cloud each side, and at times the basal suture may be dark. Scutellum with five carinae, the intermediate sometimes obscure. Male genital segment deeply notched either side of a large subtriangular median tooth; styles twice as long as the median tooth, cut off square at apex, with its inner angle produced; anal tube scarcely surpassing the styles. In *fulvidorsum* the median tooth is more ligulate, the styles narrower with their apex less produced inwardly, the anal tube is longer and the elytral nervures punctate only at apex.

Described from numerous examples taken as follows: Ceralbo Island, June 7; Santa Cruz Island, May 27, on *Atriplex*; Angeles Bay, May 5, on *Atriplex*; San Esteban Island, April 19; Espiritu Santo Island, June 1; Mejia Island, April 30. This species was abundant everywhere on *Atriplex*. Often the body is thickly covered with a white bloom.

Type: Male, No. 1083, and *allotype*, female, No. 1084, Mus. Calif. Acad. Sci., collected June 7, 1921, on **Ceralbo Island, Gulf of California.**

230. *Myndus occidentalis* Van Duzee

Angeles Bay, May 4; Pond Island Bay, Angel de la Guardia Island, June 30, J. C. Chamberlin.

231. *Hysteropterum morum* Van Duzee, new species

Allied to *fozcleri* (*montanus* Fowler), darker in color with more convex clypeus. Length 6 to 7 mm.

Vertex almost twice wider than long, parallel, its surface even, strongly elevated either side with margins acute and base carinate; front nearly flat, its greatest width three fifths its length; base deeply sinuately emarginate; its apex roundedly emarginate, widest near apex; tricarinate, the intermediate carina nearly rectilinear, evanescent above; clypeus convex, scarcely raised above plane of front; median carina obtuse, sides fusco-striate; surface clothed with short erect hairs. Pronotum a fourth longer than vertex, median carina nearly obsolete. Scutellum almost as long as head and pronotum together, tricarinate, the median acute. Elytra strongly bullate; nervures prominent; inner ulnar abruptly forked at one third its length; costa moderately angled; surface clothed with scattering short pale hairs, more conspicuous along the costa. Anal plate of female attaining ventral margin of genital segment, parallel, convex, clothed with rather long stiff pale hairs.

Color, blackish fuscous, varied with pale in places; orbits of eyes; basal nervure and extreme tip of clavus, a broad transverse band on disk of elytra before the middle and the costal region notably pale; disk of elytral areoles paler brown, dotted with fuscous; pronotum and scutellum with a paler lateral area either side, more or less obvious; legs clothed with pale hairs, the femora and tibiae twice banded with pale; hind tibiae with two stout black teeth.

Described from one female taken at the bay at southern end of Tiburon Island, July 5, and a male from my personal collection taken on the Rincon Mts., Arizona. This large blackish species has much the aspect of *Picumna ovatipennis* Walk. but is very distinct structurally.

Type: Female, No. 1085, Mus. Calif. Acad. Sci., collected July 5, 1921, at southern end of Tiburon Island, Gulf of California. *Allotype*, male, in author's collection.

232. *Hysteropterum bufo* Van Duzee, new species

Allied to *cornutum*, with a narrower front and longer pronotum. Length 3.5 to 4 mm.

Vertex short, its median length one fourth its width; anterior margin straight, posterior broadly arcuated; sides strongly elevated. Front short, a fourth longer than broad, sides feebly arcuated, more abruptly so at apex; disk with three parallel carinae; base and apex broadly excavated, the latter more feebly. Clypeus convex, a little prominent beyond the plane of the front, apex abruptly inflexed, median carina obtuse. Pronotum over three times longer than vertex on median line, the median carina feeble. Scutellum shorter than pronotum, feebly unicarinate. Elytra a fourth longer than broad, strongly bullate; costa very obtusely angled; apex truncately rounded; inner claval vein strongly bullate, the commissure deeply concavely arcuated; veins prominent, inner ulnar forked at apical third; hind tibiae with one strong tooth.

Color, most variable, grayish testaceous and fuscous, sometimes nearly black or varied with green on head and pronotum, usually with a paler area at apex of front; elytra entirely pale or brown with fuscous veins and dots in the areoles. Elytra, clypeus, legs and anal plate with short erect pale hairs.

Described from numerous examples taken on Lycium as follows: Ceralbo Island, June 7, 8; Puerto Ballandra, Carmen Island, May 21, 22; Loreto, May 20; San Pedro Bay, July 7. Both this species and *cornutum* have the hind tibiae unispinose but they are apterous and it does not seem necessary to establish a new genus on the unispinose tibiae alone.

Type: Male, No. 1086, and *allotype*, female, No. 1087, Mus. Calif. Acad. Sci., collected June 7, 1921, on Ceralbo Island, Gulf of California.

EUTHISCIA Van Duzee, new genus

Aspect of *Mycterodus* but closely allied to *Thiscia* Stål. Impunctate. Vertex horizontal, conically produced, ecarinate, with the margins acute. Front occupying the entire face, ecarinate, convex, the sharply carinate sides joining the vertex close to the eyes; deeply excavated to receive the base of the clypeus. Clypeus long, straight, moderately convex transversely, ecarinate. Pronotum short, broadly rounded before, very feebly concavely arcuated behind, ecarinate or nearly so. Scutellum large, as long as broad, tricarinate. Elytra ample, vertical, somewhat bullate, enclosing the body and meeting below; venation about as in *Acanalonia* but with much less reticulation; wings rudimentary. Abdomen compressed. Hind tibiae unarmed.

This genus differs from *Thiscia* by the very broad smooth front, much simpler elytral venation and rudimentary wings. Type of genus *Euthiscia signata* Van Duzee, new species.

233. *Euthiscia signata* Van Duzee, new species

Testaceous white; head, pronotum, scutellum and clavus marked with brown, the inner margin of corium with a connecting black spot. Length 5 to 7 mm.

Vertex a third longer than wide, narrowly rounded at apex, flat, the margin acutely reflexed. Front as long as wide, viewed from the side forming a straight line with the clypeus, subcylindrical. Pronotum a third as long as vertex, lateral carinae indicated; lateral carinae of scutellum parallel, the median subobsolete. Elytra five eighths as wide as long; costa broadly rounded, subangulate below the bulla; apex truncate. Head, pronotum and scutellum pale brown, minutely irrorate with paler; clavus coarsely irrorate with fuscous, the veins blackish; this fuscous color covers the apical two thirds of the inner sutural area of the corium and at its inception invades the adjoining area in a semicircular spot; veins about the bullae touched with fuscous as well as the extreme apical margin; anterior and intermediate tibiae faintly irrorate with brown; tarsi brown.

Described from six examples. Espiritu Santo Island, May 31; Agua Verde, May 26; San Carlos Bay, July 8, 9. Two females are darker, leaving the dark dorsal markings obscure.

Type: Male, No. 1088, and *allotype*, female, No. 1089, Mus. Calif. Acad. Sci., collected May 31, 1921, on Espiritu Santo Island, Gulf of California.

234. *Euthiscia tuberculata* Van Duzee, new species

Smaller and shorter than *signata*, with six tuberculate elevations above, two on the vertex, two on pronotum and two on scutellum; elytra strongly angled. Length 3.5 to 4 mm.

Vertex as long as broad, obtusely angled before, nearly flat, a little elevated at base and apex, sides scarcely carinate before the eyes; opposite each eye raised in a blunt tubercle. Front slightly longer than wide, its greatest width just above antennæ; base subacutely produced and almost tuberculate below apex of vertex; basal suture of clypeus obsolete at middle; viewed from side the contour of front is nearly straight, a little depressed between the eyes; clypeus flat on disk, its sides angled or subcarinate at base. Posterior margin of pronotum practically straight, anterior raised in a tubercle either side behind inner angle of eyes, the median line obsoletely impressed as is the base of vertex. Scutellum with lateral carinæ elevated in prominent tubercles in line with those of the head and pronotum; median line obscurely impressed at base and subcarinate toward apex, the apex obtuse and caloused. Elytra but little longer than broad, scarcely exceeding the elevated apex of clavus; costa strongly angled in male and oblique to apical angle; in female broadly rounded almost from base. Wings reduced to a minute scale. Hind tibiæ unarmed.

Color, grayish brown varied with fuscous or black, forming a broad band on base of front and sides of head, pronotum and scutellum; clytral veins thick and discolored in places, especially along the commissural area; clypeus blackish, paler along middle, the basal suture black either side; anterior and intermediate legs irrorate with brown, the tibiæ brown on their inner face. In the female the dark markings are more extended, the upper surface being sometimes dark greenish or almost black. In these dark individuals there may be a large pale area about the elytral bullæ.

Described from numerous examples taken as follows: Palm Cañon, Angel de la Guardia Island, May 3, on *Sideroxylon*; San Marcos Island, May 12; San Francisco Island, May 30; Espiritu Santo Island, May 31; Ceralbo Island, June 6, 7; Marquer Bay, Carmen Island, May 23; Coronados Island, May 18; Monserrate Island, June 13; Guadalupe Point, Concepcion Bay, June 17; Angeles Bay, June 27. This differs from the type species of the genus by the short vertex, tuberculate dorsum and subcarinate sides of the clypeus.

Type: Male, No. 1090, Mus. Calif. Acad. Sci., collected June 27, 1921, at Angeles Bay, Lower California. *Allotype*, female, No. 1091, collected June 13, on Monserrate Island, Gulf of California.

235. *Acanalonia puella* Van Duzee new species

Closely allied to *virescens* Stål, the front with no trace of a median carina, elytra longer, parallel, and genital characters different. Length to tip of elytra 6.5 to 8 mm.

Vertex half as long as wide at base, anterior and posterior margins parallel, surface flat, sloping, passage to front broadly rounded. Front

a little broader than long; sides parallel, base prominent but not tumid, without carinae. Pronotum as long as vertex, less deeply excavated behind than in *virescens* and with scutellum entirely ecarinate. Elytra more than twice longer than wide, parallel from basal third; apex rounded-truncate; venation weaker than in *virescens*. Last ventral segment of female truncate, parallel, with very slight median notch. In *virescens* this segment is triangularly produced and deeply notched at apex.

Color, yellowish green becoming a clear pale green on the elytra, the slender apical margin of elytra brown; wings white with brown nervures.

Described from one pair taken at Guaymas, April 10, and one male from San Carlos Bay, Sonora, July 9. This species is really much nearer to *clypeata* but the much smaller and flatter clypeus will at once distinguish it. It may be the "narrow form" of *virescens* mentioned by Fowler in the *Biologia*.

Type: Male, No. 1092, and *allotype*, female, No. 1093, Mus. Calif. Acad. Sci., collected April 10, 1921, at **Guaymas, Sonora, Mexico**.

236. *Cyarda subfalcata* Van Duzee, new species

Elongate, narrow, elytra subfalcate at apex; brown, varied with black. Length 6.5 to 9 mm.

Vertex nearly three times wider than long, nearly truncate, with a large angulate depressed area. Front a little wider than long, broadly depressed longitudinally, ecarinate; sides elevated, base rounded; clypeus broad, flat, scarcely carinate. Pronotum strongly lunate, anterior margin nearly attaining anterior line of eyes, posterior subangularly excavated; mesonotum flat above, obtusely bicarinate. Elytra three times longer than wide, somewhat bullate, widest just behind the bullæ, about a fourth narrower at apex of clavus, then slightly widened to the nearly vertical and slightly falcate tip; costal membrane closely set with heavy fuscous, slightly oblique veins; claval granules occupying basal half of inner areole; areoles of corium with very few transverse veins.

Color, fuscous brown becoming paler on vertex and front, and almost testaceous on the coxæ and legs; abdomen varied with pale; elytra pale brown with heavy fuscous veins. Fresh specimens are covered with a white bloom.

Described from 17 specimens taken as follows: Coronados Island, May 18; Ceralbo Island, June 7, on *Lycium*; Espiritu Santo Island, May 31; Las Animas Bay, May 8. This species superficially resembles *Cyarda acuminipennis* as figured by Melichar (pl. 7, fig. 12), but the apex of the elytra is wider, more deeply falcate and vertical, and it is a much

smaller insect. It certainly belongs to genus *Cyarda* of Stål but that may have to be separated from *Cyarda* of Walker under Kirkaldy's name *Gelastophanta*. This however cannot be done without a careful examination of *acuminipennis*.

Type: Male, No. 1094, and *allotype*, female, No. 1095, Mus. Calif. Acad. Sci., collected May 18, 1921, on Coronados Island, Gulf of California.

237. *Rhynchopteryx caudata* Van Duzee

Very common everywhere we worked. The following localities are represented in the material brought home: Tepoca Bay, April 23; Lagoon Cove, Angel de la Guardia Island, May 2; Ceralbo Island, June 6, 7; San José Island, June 10; San Francisco Island, May 30; San Esteban Island, April 19; San Carlos Bay, July 8; Escondido Bay, June 10; Monserrate Island, May 25, June 13; Salinas Bay, Carmen Island, June 16; San Marcos Island, June 19; bay at south end of Tiburon Island, July 4; Guadalupe Point, Concepcion Bay, June 17; San Francisquito Bay, June 10; San Pedro Bay, July 7. Those from San Francisco Island were taken on *Parosela divaricata cinerea*, the angular seeds of which they very closely resembled. I also took them on palo tinto and *Laccodesmia*. It is quite likely that this name will have to be sunk as a synonym of *Mistharnophantia sonora* Kirkaldy in spite of the fact that he says the vertex scarcely extends before the eyes while here it surpasses them by more than half its length, that the front is ecarinate while he states that it is "medianly keeled", and that the scutellum is distinctly tricarinate while he says "bicarinate". He also fails to mention the tail-like extension of the elytra, a very prominent character. The species is absolutely unrecognizable from Kirkaldy's description and I never would have thought of placing them together were it not that the Koebele collection contains specimens of *Rhynchopteryx caudata* bearing the Koebele number given by Kirkaldy for his *sonorana*. Until the synonymy is settled I use the name given by me which correctly places the species.

238. *Dascalía edax* Van Duzee, new species

Aspect of *Ormenis pruínosa*, but smaller, darker, with much simpler venation. Length 6 mm.

Vertex as in *pruínosa*, very short, transverse. Front a little broader than long; median carina barely indicated; surface depressed with sides a little elevated. Pronotum nearly three times as long as vertex, subangularly emarginate behind; disk depressed with median line feebly raised at times. Mesonotum flattened with lateral carinae scarcely indicated; moderately raised above plane of pronotum; apex reflexed. Elytra nearly three times as long as wide; margins parallel beyond the feeble bullæ; costal membrane wider than costal areole, fuscous with edge and transverse veins pale; claval granules filling basal half of inner areole; corium with a few granules just behind the bulla; nervures heavy at base, obscure toward apex, with very few transverse veins, forming, however, two series of broad apical areoles. Hind tibiae bispinose.

Color, fuscous or almost black in male; apex of front paler; clypeus and beneath yellowish testaceous; commissural margin slenderly pale; costal membrane and region of claval suture and sometimes base of clavus, paler or ferruginous brown; cheeks and antennæ pale. Immature examples are much paler and occasionally the head is entirely pale in mature examples. When fresh they are covered with a white bloom.

Described from 109 examples taken as follows: San Marcos Island, May 12, June 19; Loreto, May 19; Coronados Island, May 18; Escondido Bay, June 14; Monserrate Island, June 13; San Diego Island, May 27; Puerto Ballandra, Carmen Island, May 22; Marquer Bay, Carmen Island, May 23; south end of Tiburon Island, July 5; Angeles Bay, June 27; Guadalupe Point, Concepcion Bay, June 17; San Francisco Island, May 30; San José Island, May 29; Puerto Refugio, Angel de la Guardia Island, May 1; San Lorenzo Island, May 9; Espiritu Santo Island, May 31; Palm Cañon, Angel de la Guardia Island, May 3; Ceralbo Island, June 8. Mostly taken on *Lacodesmia* and the related mesquite but also found on *Sideroxylon*, creosote bush, *Pertyle*, etc.

Type: Male, No. 1096, and *allotype*, female, No. 1097, Mus. Calif. Acad. Sci., collected May 12, 1921, on San Marcos Island, Gulf of California.

239. *Flatoides enotus* Van Duzee, new species

Aspect of and closely allied to *fuscus* Van D., but with longer vertex and flatter mesonotum; blackish fuscous marked with fulvous brown. Length 11 mm.

Vertex about as long as broad, abruptly constricted at about half its length before the eyes, the apex blunt conical; surface deeply impressed from near base, with an oval apical raised area in which is a broad median longitudinal furrow. Front twice longer than wide, widest at the antennæ; sides beyond front line of eyes broadly arcuated and obtusely carinate or calloused; apex very feebly concave; surface flat below, convex or subcylindric on apical half with an obscure longitudinal furrow. Clypeus large, flat, ecarinate. Pronotum flat, ecarinate, the truncate apex almost in line with front of eyes; sides anteriorly carinate and somewhat elevated; lateral portion with prominent tubercle behind the eyes; hind edge deeply angularly excavated; surface with an impressed point either side. Mesonotum flat, in same plane with pronotum, the lateral carinæ represented by a thick curved ridge. Elytra nearly three times as long as wide, broadest before the bulla; costal membrane very wide near base, sinuate opposite stigma; venation strong, confused behind middle, with one regular series of apical transverse veins continuing the costal membrane; claval granules few, following the veins on their basal half; costal membrane with a few pustules in two ill-defined series. Hind tibiæ bispinose.

Color, blackish fuscous; elytra pale yellowish brown with heavy fuscous venation; body and legs testaceous varied with fuscous brown; median line and two dashes either side on pronotum and three longitudinal vittæ on central field of mesonotum, fulvous; front pale, becoming blackish with a series of black points near either side.

Described from one female taken on San Esteban Island, on *Bursea* bushes. With this were two pale immature females that certainly belong to this species. In life, this insect is covered with a whitish incrustation such as is frequently found in related forms.

Type: Female, No. 1098, Mus. Calif. Acad. Sci., collected April 19, 1921, on San Esteban Island, Gulf of California.

240. *Stobæra concinna* Stål

Mulegé, May 15, abundant on *Ambrosia tenuifolia*.

241. *Stobæra minuta* Osborn

Mejia Island, April 30; Puerto Refugio, Angel de la Guardia Island, May 1, on *Hymenoclea* at both places.

242. *Liburnia* species

Mulegé, May 15, abundant on *Monanthoclea*; San Francisco Island, May 30, on same grass; San Carlos Bay, July 9, on grass about spring; Tepoca Bay, April 25, on *Monanthoclea*.

243. *Aphalara punctellus* Van Duzee, new species

Very small; pale yellowish, wings faintly smoky with numerous minute round clear points, quite regularly distributed; antennæ nine-segmented. Length 2 mm.

Vertex flat, moderately depressed, with an impression either side the median line, the lobes angularly rounded before, projecting but little before the frontal ocellus; cheeks forming an oblique rounded lobe either side the tumidly prominent clypeus; antennæ apparently nine-segmented; segment IX about two thirds the length of VIII and nearly connate with it. Male genital valve subcylindric when seen from side, rounded below and narrower at apex; forceps broad, pyriform, rounded at apex; anal valve ligulate, over four times as long as wide. Wings narrow, nearly parallel; venation normal for the genus; texture subopaque; color pale yellowish brown with numerous fairly uniform roundish hyaline dots; antennæ slightly infuscated.

Described from three males taken at San Nicolas Bay.

Type: Male, No. 1099, Mus. Calif. Acad. Sci., collected May 16, 1921, at San Nicolas Bay, Lower California.

244. *Aphalara mera* Van Duzee, new species

Small; clear light yellow; elytra hyaline, heavily maculated at apex; antennæ annulated. Length 2.5 mm.

Vertex sloping, slightly convex, nearly twice wider than long, with an impressed point either side the incised median line; lobes narrowed and rounded before; genæ sublunately convex, the tumid clypeus nearly filling the space between them. Antennæ ten-segmented, more than twice longer than width of head including the eyes. Male forceps oblong; anal valve formed much as in *pulchella*, the ventral lobe shorter and rounded at apex. Color a clear light fulvous yellow, becoming more whitish on legs and abdomen and testaceous on head; antennal segments annulated with black at apex, the annuli increasing in width from III. Wings hyaline, with a broad black concentric apical band carrying a clear marginal spot at center of each areole, that in the fourth bisecting the band; clavus with a black line at apex; pterostigma long and slender; tarsal claws black; tergum with black median vitta extending to the genital pieces.

Described from six males and 12 females taken at San Nicolas Bay, on *Atamisquæa emarginata*.

Type: Male, No. 1100, and *allotype*, female, No. 1101, Mus. Calif. Acad. Sci., collected May 16, at San Nicolas Bay, Lower California.

245. *Aphalara nupera* Van Duzee, new species

Straw-yellow; fore wings white, varied with fuscous. Length 2 mm.

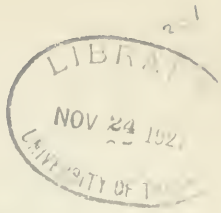
Vertex barely twice wider than long, with a large fova either side of the incised median line; anterior margin produced in a rounded or almost conical prominence; clypeus large, strongly produced in an erect conical process; mesonotum armed with a small tubercle either side behind the lateral pronotal tubercles; antennæ ten-segmented, nearly twice longer than width of head. Male forceps clavate, truncate at apex; anal valve with dorsal member truncate, ventral three times longer than dorsal, narrowed apically with tip rounded, the whole genitalia much as in Crawford's figure 172 (Bul. 85, U. S. Nat. Mus.). Color straw-yellow varied with a fulvous tint on head and thorax or with dull brownish in the male; abdomen in male largely black. Elytra whitish hyaline, marked with a transverse fuscous band a little before the apex; a large spot on middle of commissure and a small one on middle of costa; median field of disk dotted with fuscous flecks with a broad vitta of same at basal fourth, not reaching costa. In the female the colors and markings are paler.

Described from seven male and 18 female examples taken as follows: Angeles Bay, May 4; Gonzales Bay, April 29; Tepoca Bay, April 25.

Type: Male, No. 1102, and *allotype*, No. 1103, Mus. Calif. Acad. Sci., collected April 29, 1921, at **Gonzales Bay, Lower California.**

246. *Aphalara veaziei metzaria* Crawford

San Esteban Island, April 19, one female that seems to differ from material from the eastern states only in having the elytra sparsely but distinctly dotted almost to their base.



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XII
EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹

THE TENEBRIONIDÆ

BY

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One of the most interesting collections of Coleoptera that has been made in Lower California since that secured by Dr. Gustave Eisen in 1893 in the region about San José del Cabo, was taken by the Expedition of the California Academy of Sciences to the islands of the Gulf of California.

Of this material the Coleoptera belonging to the family Tenebrionidæ were submitted to me for study and they have proved by far the richest aggregation of species peculiar to the hot and arid Sonoran desert region that it has ever been my pleasure to examine. The total number of specimens of Tenebrionidæ in this material is 1410, representing 103 species and races of which 60 are new to science. These belong to 19 tribes and 41 genera of which four are new. The known range of several species has been extended, notably *Craniotus pubescens* Lec., heretofore recorded only from the Maricopa and Colorado deserts.

The species inhabiting these hot and dry regions exhibit a

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

July 10, 1923

wonderful adjustment to their environment. The teguments are adapted to meet the demands against evaporation and to conserve the body fluids. This is secured by the manner in which the large mentum makes it possible to close the buccal aperture, and the interlocking of the last ventral segments and the lower margin of the epipleura at the elytral apex, especially in the Eurymetopini, practically sealing up the body against the drying effect of the desert.

During the time the expedition was in the field, 29 islands were visited and the following localities on the mainland either side of the Gulf: On the Sonoran coast; Guaymas, San Carlos Bay, San Pedro Bay, and Tepoca Bay; in Lower California; Gonzales Bay, Angeles Bay, Las Animas Bay, San Francisco Bay, Mulegé, Concepcion Bay, San Nicolas Bay, Loreto, Escondido Bay, Agua Verde and La Paz.

The following systematic report is here presented:

Family TENEBRIONIDÆ

EURYMETOPINI

1. *Metoponium laticolle* Casey

Easily recognized by its large size and greatly developed prothorax which is slightly wider than the elytra. In the female, the mesosternal epimera are coarsely punctured, in the male the punctures are mainly along the anterior border of these sclerites. First described from Arizona near Yuma. Length 6-8 mm. A series of 18 specimens was taken at Mulegé, May 14, and at Puerto Ballandra, Carmen Island, May 22.

2. *Metoponium candidum* Casey

Two specimens were taken at Guaymas, April 10. First described from specimens collected at Nogales, Arizona. It is known by its large size, parallel and convex form, and rather strong punctuation. Length 6-8 mm.

3. *Metoponium pacificum* Blaisdell, new species

Form oblong-oval, robust and strongly convex. Luster dull, color piceous black; antennæ and legs dark rufous.

Head slightly transverse, strongly and coarsely punctured, punctures discrete in the central area, becoming coarser and longitudinally coalescent laterally with formation of rugæ. Epistoma arcuato-truncate at apex, slightly notched laterally at the oblique sutures; mentum evenly convex. Eyes not prominent; sides of head rather evenly arcuate, converging slightly anteriorly. Antennæ rather stout.

Pronotum transverse, about a half wider than long; apex evenly and slightly sinuate in nearly circular arc; apical angles obtuse and distinct; base arcuate at middle, feebly bisinuate on each side; angles obtuse; sides rather broadly, not strongly, arcuate from base to apex, more strongly so anteriorly; disk rather evenly convex, rather coarsely and closely punctate, laterally the punctures coalescing to some extent; intervals forming feeble rugæ.

Elytra strongly convex, arcuately declivous posteriorly; punctures rather small, showing a more or less serial arrangement, becoming finely muricate laterally.

Beneath rather coarsely punctate; punctures shallow, those of the propleura large and deep, more or less coalescent, forming coarse longitudinal rugæ. Mesosternal epimera punctured like the episterna of the same segment. Abdomen less strongly punctured.

Legs rather short and stout; apical prolongation of the anterior tibiæ stout and blunt. Described from the unique type.

The specimen, serving as the type, unfortunately is rather soiled and difficult to clean. It is distinct by its oval, convex and robust form. Length 7.2 mm.; width 3.5 mm.

Type: Female, No. 1104, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 4, 1921, at La Paz, Lower California.

4. *Metoponium angelicum* Blaisdell, new species

Form oblong-oval, stout, about $2\frac{1}{2}$ times longer than wide, rather more than moderately convex; sides slightly arcuate. Color, piceous black; antennæ and legs more or less dark rufous; under surface dark rufo-piceous. Surface shining.

Head about three-fifths as wide as pronotum; epistoma truncate; sides only moderately convergent from the prominent part of the eyes; frontal angles rounded; surface flattened, broadly and feebly impressed, coarsely punctured; punctures well separated, especially about the occipital smooth spot; laterally a few of the punctures show a tendency to coalesce, transversely so along the apical margin of the epistoma; labrum finely and sparsely punctured centrally and at base, coarsely so along the margins; each puncture with a small seta; supra-orbital carina rather strong. Antennæ slender and moderate in length.

Pronotum about a third wider than long, convex, slightly flattened at middle; apex slightly emarginate, angles obtuse and distinct; sides rather evenly but not strongly arcuate, less so anteriorly, marginal bead moderate; base feebly lobed at middle, slightly bisinuate laterally, mar-

ginal bead rather broad; basal angles obtuse and not in the least rounded; disk finely and sparsely punctate in central third, becoming coarsely so laterally, punctures more or less coalescent longitudinally; intervals rather convex and coarse, tending to form rugæ; each puncture with a small seta.

Elytra somewhat oval, truncate at base; humeri obtuse and not prominent; sides feebly arcuate, rather broadly rounded at apex; disk with closely placed series of moderately small, subequal punctures, those of the intervals rather more widely spaced; punctures slightly confused and setigerous laterally and on apex.

Propleura with very large rounded and shallow punctures, well separated, with the intervals feebly rugose; mesosternal episterna coarsely and sparsely punctured, the adjacent epimera dull and quite impunctate.

Abdominal segments finely and sparsely punctured along the middle third, punctures still sparse and slightly larger laterally.

Male rather narrower than female with the prothorax relatively slightly larger.

Length (types), 7.5-8.5 mm.; width 3.0-3.4 mm.

Nine specimens: Angeles Bay, May 7, J. C. Chamberlin; Shore of Las Animas Bay, May 8, E. P. Van Duzee.

In form, *angelica* resembles *convexicolle* Lec., but differs in the more or less polished surface. In *convexicolle* the punctation is denser and coalescent with formation of rugæ on the head; rugæ more evident on the sides of the pronotum and the abdominal punctation is a little coarser.

Type: Female, No. 1105, and *allotype*, male, No. 1106, Mus. Calif. Acad. Sci., collected May 7, 1921, at Angeles Bay, Lower California. Paratypes in the Academy collection and in that of the author.

5. *Telabis serrata* LeConte

Two specimens were secured on the mainland of Lower California, at Las Animas Bay, May 8, and at Angeles Bay May 7. *T. serrata* is pale testaceous in color, winged, and has the outer border of the anterior tibiæ distinctly serrate. It occurs at El Paso, Texas, and in New Mexico.

6. *Telabis punctulata* LeConte

In the female of *punctulata*, the fourth abdominal segment has a median porrect lobe at apex which extends to the middle of the last segment. Three specimens were secured, all apparently males, two being somewhat doubtfully referred to this species. The localities are: Loreto, May 20; Las Animas

Bay, May 8, and Pelican Island, at Keno Point, July 5. It was described from Lower California and Casey gives Cape San Lucas.

7. *Telabis hirtipes* Blaisdell, new species

Form oblong-subovate, a little wider posteriorly, moderately convex, slightly more than twice as wide as long. Color, piceous above, rufo-piceous beneath, antennæ and legs dark rufous; luster rather dull, slightly shining.

Head small, a little more than one-half the pronotal width; eyes prominent; sides of front converging and strongly arcuate from the eyes; surface broadly impressed between the antennal convexities, slightly prominent along the base of the epistoma; vertex feebly convex, closely and moderately coarsely punctate, punctures rounded and shallow, well separated in central area, becoming more or less coalescent laterally, reticulately so on the epistoma but discrete on the sides of the front; epistoma slightly advanced and truncate, notches shallow and broadly triangular; labrum very finely and sparsely punctured, with a row of coarse punctures along the margin. Antennæ moderate.

Pronotum about twice as wide as long, widest at middle, moderately strongly convex; apex broadly and moderately sinuate; marginal bead moderately thin, angles subacute and slightly prominent anteriorly; sides broadly and rather strongly arcuate, becoming broadly and feebly sinuate behind the apical angles and rather straight posteriorly; margin very narrowly and evenly impressed and obsoletely crenulate; base broadly arcuate in middle fifth, thence feebly sinuate to become slightly arcuate to the angles which are obtuse, distinct; marginal bead broad at middle; disk rather moderately densely punctate; punctures shallow, smaller and well separated in the central area, becoming larger and lunate (open posteriorly) and not noticeably coalescent, feebly muricate toward the margin.

Propleura longitudinally rugose, with sparse very large and shallow punctures intermixed; coxal convexities rugose.

Elytra obtuse, feebly emarginate at base, less than twice as long as wide; humeri obtuse and moderately rounded; base a little wider than the contiguous pronotal base; sides broadly and feebly arcuate, quite evenly and moderately broadly rounded at apex; disk quite evenly convex, finely, densely punctured, series more or less feebly outlined; feeble and vague longitudinal lines are seen when viewed from behind.

Mesosternal episterna very coarsely punctate, punctures very shallow; epimera impunctate except along the anterior margin. Metasternum and its side pieces not coarsely and very sparsely punctate. Abdomen finely and very sparsely punctate, sides of first segment also sparsely and a little more coarsely punctate.

Legs rather slender and rather less than moderate in length. Posterior face of the dilated outer angle of anterior tibiæ rather strongly concave; inner border rather thickly set with hair-like setæ toward apex. All punctures beneath setigerous, bearing rather long hairs. Described from the unique type.

Length (type) 7.5 mm.; width 3.5 mm.

Type: Female, No. 1107, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 13, 1921, on **Santa Inez Island, Gulf of California.**

Judging by Casey's table, *hirtipes* is related to *punctulata* Lec. In the latter species the female has a porrect lobe at middle of apex of the fourth abdominal segment which extends to the middle of the last segment. *Hirtipes* is finely muricate while *punctulata* is rather strongly so.

8. *Telabis lunulata* Blaisdell, new species

Form oblong-oval, about $2\frac{1}{2}$ times as long as wide, moderately convex. Color nigro-piceous above, rufo-piceous beneath, with the legs, antennæ and mouth-parts dark rufous. Luster dull, but feebly shining; surface microscopically granulate.

Head moderately small, rather strongly, broadly, transversely impressed between the antennal convexities; eyes prominent; sides arcuate to the frontal emarginations; epistoma truncate; supraorbital carina quite strong; punctures moderate in size, close, slightly less so in the central area and on vertex, scarcely coalescent laterally, those on the epistoma distinctly transversely coalescent; anterior margin of the punctures stronger and more prominent than the posterior. Antennæ moderate in length and rather slender. Labrum finely and sparsely punctate; punctures coarse and coalescent along the margins.

Pronotum transverse, about twice as wide as long, widest just behind the middle; apex evenly and moderately sinuate; apical angles distinct, obtuse, not prominent, very narrowly rounded; sides quite strongly and evenly arcuate, straighter and broadly but very feebly sinuate anteriorly to apical angles, straighter posteriorly to the basal angles; base moderately lobed at middle third, thence feebly and broadly sinuate and then feebly arcuate to the angles which are obtuse and distinct, marginal bead rather wide; disk rather strongly convex, briefly somewhat declivous along the basal margin in middle two-fourths, feebly impressed opposite the sinuations; punctures moderately large, closely crowded, but slightly separated centrally where the intervals are about one to three times the diameter of the punctures; punctures laterally slightly larger, not coalescent and open posteriorly.

Propleura not strongly longitudinally rugulose; punctures large, sparse and shallow.

Elytra scarcely twice as long as wide; base equal to pronotal base; humeri obtuse and not in the least prominent; sides slightly arcuate; apex rather evenly and broadly rounded; disk moderately convex, finely and irregularly punctate; series of very fine punctures faintly indicated; punctures finely subasperate with a few widely placed asperities on the apical declivity.

Mesosternal episterna rather sparsely punctured, punctures large and shallow; epimera smooth with a line of punctures along the anterior margin. Under surface sparsely and not strongly punctured. Abdominal punctures sparse, moderately small, somewhat evenly distributed, very little larger laterally; each puncture with an appressed hair.

Male rather more parallel than female.

Length (types) 6.4 to 6.8 mm.; width 2.8 to 3 mm.

Described from eight specimens. Ceralbo Island, June 7; Angeles Bay, May 7.

Type: Female, No. 1108, *allotype*, male, No. 1109, collected by E. P. Van Duzee, June 7, 1921, on **Ceralbo Island, Gulf of California**. Paratypes in my own collection and in that of the Academy.

According to Casey's table, *lunulata* belongs to the *punctulata* group. It differs from *punctulata* by the absence of the porrect lobe of the fourth abdominal segment in the female besides being less strongly punctured. In *hirtipes* the under surface is distinctly more pubescent and the pronotal disk is more evenly convex at base. In *lunulata* the pronotal disk while not obliquely and feebly prominent toward the basal angles is feebly, briefly and rather suddenly declivous along the basal margin, with feeble impressions opposite to the basal sinuations.

9. *Telabis latipennis* Blaisdell, new species

Form oblong-subovate, moderately convex and rather broad; color piceous above, rufo-piceous beneath; antennæ, mouth-parts and legs more or less dark rufous; surface rather shining.

Head relatively small, rather strongly transverse, broadly impressed between the antennal convexities; epistoma evenly convex and truncate at apex; eyes moderately prominent; sides convergent and feebly arcuate; supra-orbital carina rather strong; closely punctate, punctures moderately coarse and shallow, more or less separated on vertex; impunctate spot small; punctures denser laterally and more or less coalescent, those on the epistoma distinctly so between the transverse rugæ. Antennæ moderate in length and stoutness. Labrum finely and sparsely punctate, punctures coarser along the margin.

Pronotum transverse, widest at middle; about twice as wide as long; apex feebly sinuated in an almost circular arc, bead rather wide and flat; apical angles obtuse, distinct and not prominent; base three-eighths wider than apex, feebly trilobed, feebly and broadly sinuate at middle third, marginal bead broad and flat, narrowing outwardly to angles; the latter obtuse and slightly blunt; sides rather strongly arcuate at middle and basal third, straighter and convergent anteriorly; disk mod-

erately strongly and evenly convex, somewhat declivous toward apical angles, punctures moderately small, well defined, separated by a distance equal to one to three times their diameter, laterally coarser, less well defined, close, not coalescent and open posteriorly, denser at angles and close to margin, scarcely subasperate.

Propleura with very large shallow punctures which are well separated; surface feebly rugose, most so on the coxal convexities.

Elytra rather broadly oblong-oval, about a half longer than wide; humeri moderately distinct and rounded; base equal to the pronotal base; sides rather broadly and moderately arcuate, broadly rounded at apex; disk moderately convex; punctures moderately small and dense, subequal throughout, feebly asperate; closely placed series very feebly indicated; rather denser along the base, sides and apex; with the usual small very sparse asperities on apical declivity. A number of moderately long hairs about the humeri and along the epipleura.

Mesosternal episterna with large shallow punctures; epimera impunctate.

Abdomen finely sparsely punctured; surface more or less feebly rugulose, especially along the sides and on first segment; last two segments obliquely upturned to clasp the apical margin of the elytra in repose. Legs moderately long and stout; femora sparsely punctured, punctures with long hairs; outer margin of anterior tibiae somewhat serrulate.

Length (type) 7 mm.; width 3.3 mm.

Type: Female, No. 1110, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 23, 1921, at **Marquer Bay, Carmen Island, Gulf of California.**

Latipennis, *hirtipes* and *lunulata* all belong to the *punctulata* section of the genus according to Casey's table of characters. It is also true that they bear a close resemblance to one another but appear to present sufficiently good characters for specific separation. *Latipennis* is broadly oblong-suboval, pronotum more strongly arcuate, widest at middle and more rapidly converging and straight anteriorly, sides of front less arcuate, nearly straight and convergent to the emargination; pronotal punctures not coalescent laterally, very distinct centrally; last two abdominal segments obliquely upturned in the female. *Hirtipes* is oblong-oval, the pronotal punctures are distinctly coalescent laterally; last two abdominal segments not upturned at apex in female. In *lunulata* the form is less stout, more elongate and narrower; the pronotal punctures are denser, less well defined, more asperate and scarcely at all coalescent; surface duller in luster and last abdominal segment not oblique.

TELAPONIUM Blaisdell, new genus

Body rather broadly oval, wingless; epistoma slightly produced as in *Telabis*, emarginations at the oblique sutures distinct; upper ridge of the mandibles sharp, lateral surface concave at base, not toothed above nor swollen at base; mentum transverse, large, hexagonal, apex distinctly but not deeply emarginate, surface convex; last joint of maxillary palpi scalene and very obliquely truncate at apex; last joint of labial palpi oval, flattened; antennæ long and slender, subglabrous, with the outer four joints slightly wider; ninth and tenth triangular, eleventh oval; eyes not prominent, coarsely faceted, feebly emarginate anteriorly, supra-orbital carina distinct. Scutellum well developed, slightly angulate and a little transverse; elytra moderately inflated and margined at base. Metasternum with ante-coxal transverse grooves and about as long as third abdominal segment. Protibiæ arcuate on external border at base, nearly parallel in middle two-fourths, widening rather suddenly at the external angle which is subacutely produced; external border spinose, spines short, blunt and rather wide. Tarsi elongate, with spiniform setæ beneath; first joint of metatarsi longer than fourth.

Telaponium occupies a position intermediate between *Telabis* and *Cryptadius* and can be recognized from both by the form of the last joint of the maxillary and labial palpi. In facies it resembles *Micromes ovipennis* Horn, especially in the female, and *Cryptadius inflatus* Lec. It differs distinctly from the former in the shape of the epistoma.

Type of genus *Telaponium castaneum* Blaisdell new species.

10. *Telaponium castaneum* Blaisdell, new species

Form rather broadly oval; elytra somewhat inflated, very convex, twice as long as wide and with a facies resembling a small *Cryptadius*. Color brown-castaneous, somewhat lighter beneath; punctures setigerous.

Head broadly and feebly impressed anteriorly, rather coarsely and closely punctate, punctures coalescent on front, intervals forming arcuate rugæ; on epistoma the punctures are crowded and the intervals very narrow; sides of front evenly arcuate and convergent to the emarginations; labrum slightly sinuate at middle. Antennæ extending to beyond pronotal base.

Pronotum transverse, about twice as wide as long, quite strongly convex, narrowly declivous along basal bead; apex broadly and not strongly sinuate, marginal bead rather wide, angles obtusely rounded and not in the least prominent anteriorly; base broadly and feebly arcuate, about a third wider than apex, marginal bead moderate; basal angles obtuse and moderately rounded; sides quite strongly arcuate and converging anteriorly, bead moderate and scarcely reflexed; disk coarsely punctate, punctures slightly elongate, strigose, more strongly so laterally; median line impunctate.

Elytra a little longer than wide, very convex and moderately inflated; base about equal to pronotal base, humeri broadly rounded; sides broadly and rather strongly arcuate to the subgival apex; punctures small, sub-muricate, subserially arranged when viewed longitudinally, otherwise apparently irregular, most confused laterally and at apex; quite strongly convex antero-posteriorly.

Propleura longitudinally rugose. Prosternum with large shallow punctures; metasternum coarsely punctate, punctures deeper and rounded; mesosternal epimera very narrow within and the metasternal episternum more or less longitudinally rugulose. Abdomen very sparsely punctate, punctures shallow; sides of segments more or less rugulose. Under surface with scattered and rather long hairs; inner margins of the profemora sparsely ciliate.

Length (type) 4.3 mm.; width 2.1 mm.

San Nicolas Bay, May 16, two specimens taken from the dried pod of a wild cotton bush. A very interesting species differing mainly from the genus *Cryptadius* in the shape of the last joint of the maxillary and labial palpi.

Type: Male, No. 1111, and *paratype*, in Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 16, 1921, at San Nicolas Bay, Lower California.

11. *Cryptadius angulatus* Blaisdell, new species

Form oblong-oval, rather broad, twice as long as wide, widest at middle and strongly convex. Color dark piceous above, dark rufo-piceous beneath; legs and antennae somewhat lighter; luster dull and alutaceous; surface microscopically granulate.

Head feebly and broadly impressed; sides arcuate before the eyes, frontal margin biemarginate; epistoma feebly arcuate, slightly advanced with apical margin narrowly deflexed; surface strongly punctate, punctures well separated on vertex and at base of epistoma, elsewhere more or less concentrically punctato-rugose; supraorbital carina strong. Eyes slightly prominent. Labrum transversely oblong, flat, finely and sparsely punctate. Antennae moderately long and slender.

Pronotum twice as wide as long; apex feebly sinuate, apical angles subrectangular, narrowly rounded; base very feebly sinuate and one-fourth wider than apex; sides broadly and feebly arcuate, a little more strongly so anteriorly and only moderately convergent; basal angles obtuse and distinct; disk evenly convex from side to side, punctures rather small, slightly eroded, sparse centrally, discrete along apical and lateral margins, stronger and coalescent in lateral thirds where the intervals are convex and strong, tending to form rugae. Propleura strongly and coarsely punctato-rugose.

Elytra about a third longer than wide, base equal to pronotal base; sides moderately and broadly arcuate, less so and more convergent in

apical third; apex rather narrowly rounded; punctures not strong, in feeble but evident series, intervals with single series, somewhat irregularly placed.

Mesosternal episterna coarsely, sparsely punctate, punctures variable in size. Epimera with a few scattered punctures. Metasternal antecoxal transverse grooves crenulate posteriorly.

Legs moderate; outer face of metatibiæ flattened, of the mesotibiæ grooved, edges spinulose; protibiæ more gradually widened apically, outer angle long, lateral edge somewhat arcuate and obsolete serrulate. Abdomen finely and sparsely punctate, punctures slightly more abundant on fifth segment.

Length (type) 7 mm.; width 3.6 mm.

Angulatus is narrower than *sinuatus*, the punctuation is less distinct and the basal angles of the pronotum are obtuse.

Type: Of doubtful sex, No. 1112, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 21, 1921, at Puerto Ballandra, Carmen Island, Gulf of California.

12. *Cryptadius sinuatus* Blaisdell, new species

Form oval, somewhat oblong, moderately broad, slightly more than twice as long as wide. Color piceous; antennæ rufous, luster dull.

Head feebly biimpressed, frontal margin feebly biemarginate; apex of epistoma feebly arcuate; punctures moderately coarse, lateral or anterior margin of each puncture thickened, coalescing to a moderate degree, forming rugæ that are slightly concentric to the central area where the punctures are more or less discrete; supraorbital carina strong; sides nearly straight and moderately convergent, becoming strongly rounded at the angle. Eyes moderately prominent. Antennæ moderate in length.

Pronotum transverse, about twice as wide as long; apex feebly sinuate nearly in circular arc; apical angles obtuse and distinct; sides evenly and moderately arcuately convergent anteriorly; base feebly trilobed; basal angles subacute and slightly prominent posteriorly; disk moderately and rather evenly convex, punctures moderately small, discrete centrally, becoming slightly coarser and more or less longitudinally coalescent laterally.

Propleura very coarsely punctate; intervals evident as rather coarse longitudinal rugæ. Punctures of prosternum coarse, rounded and separated.

Elytra rather more than a fourth longer than wide, rather strongly convex; base truncate and equal to the pronotal base; humeri obtuse; sides broadly and moderately arcuate, rather obliquely so in posterior third; apex ogival, narrowly rounded; punctures not dense, rather small in closely approximated series; less strongly marked on apical declivity which is gradually formed.

Mesosternal episterna punctate, punctures variable in size, large to moderate; epimera with a row of punctures along posterior margin,

with one or two on the disk. Abdomen moderately finely sparsely punctate, those at the sides of first segment scarcely larger; slightly denser at sides of fourth and on fifth segment.

Legs relatively slender. Protibiæ subparallel; lateral margin finely and irregularly serrulate; angle long, not wide and rather abruptly formed. Protarsi somewhat thickened.

Length (type) 7.8 mm.; width 3.8 mm.

Ballandra Bay, Carmen Island, May 21. *Sinuatus* is less broadly oval and the basal angles of the pronotum are subacute and slightly prominent posteriorly. In *angulatus* the basal angles are obtuse.

Type: Female, No. 1113, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 21, at **Puerto Ballandra, Carmen Island, Gulf of California.**

13. *Cryptadius tarsalis* Blaisdell, new species

Form less broadly oval than *angulatus* or *sinuatus*; oblong, about twice as long as wide, strongly convex. Color piceous black above and dark rufo-piceous beneath; slightly dull and rather alutaceous.

Head feebly and transversely impressed anteriorly; epistoma slightly produced and truncate, defined laterally by small emarginations; sides of front evenly arcuate to the epistoma; punctures coarse, discrete in a small area on front of vertex, elsewhere coalescent; intervals forming arcuate rugæ; punctures of epistoma dense, slightly smaller and transversely coalescent with the intervals very narrow. Antennæ quite slender, ninth and tenth joints triangular and slightly more prominent anteriorly than posteriorly; eleventh short oval, very little longer than wide.

Pronotum transverse, rather more than twice as wide as long; apex truncate in almost circular arc; angles rectangular, not rounded nor prominent; base subtruncate, fully a third wider than apex, very slightly arcuate at middle and scarcely sinuate laterally; basal angles subrectangular and not rounded; sides moderately convergent anteriorly, subparallel in basal half and more strongly arcuate anteriorly; disk discretely punctate at middle; punctures coarse and coalescent laterally; intervals rather coarsely longitudinally rugose.

Elytra short, oblong-oval, truncate at base; humeri obtuse, rather distinct but not in the least prominent; sides broadly and evenly arcuate to the parabolically rounded apex; disk with rather evident striae of punctures laterally; punctures small, slightly muricato-asperate and more or less irregularly confused centrally.

Propleura coarsely rugoso-punctate; punctures not very distinct. Mesosternal episterna sparsely and very coarsely punctate, with a row of punctures along the epimera; the latter with a few much smaller punctures. Antero-lateral angle of metasternum impunctate. Abdominal

punctures rather small and sparse, a little larger laterally; closer and rather more abundant on fifth segment. Legs moderate in stoutness and length.

Length (type) 7.4 mm.; width 3 mm.

Type: Female, No. 1114, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 5, 1921 at **Angeles Bay, Lower California**. One paratype in collection of the author and one in that of the Academy.

The three species, *sinuatus*, *angulatus* and *tarsalis*, are referred to the genus *Cryptadius* for the reason that they are more in accord there than in the genera *Telabis* or *Metoponium*. The protibiæ are produced externally at tip, the frontal margin minutely biemarginate, epistoma truncate, body broadly oval, although a little less so than in *Cryptadius inflatus* Lec. In the latter species the basal angles of the pronotum are more or less rounded while in *sinuatus*, *angulatus* and *tarsalis*, these angles are distinct. LeConte does not define the pronotal angles in his original generic diagnosis. Casey had only *inflatus* and phases, with rounded basal angles, when he reviewed the genus. The genus *Cryptadius* as now extended will permit of the following synoptic statement:

Basal angles of pronotum obtusely rounded (see Casey's Revision)*.....	<i>inflatus</i> Lec. and its phases	
Basal angles distinct.....		1
1. Basal angles obtuse and narrowly rounded; labrum finely punctate; pronotal punctures less strong; mandibles feebly bifid at tip.....	<i>angulatus</i> n. sp.	
Basal angles not in the least rounded.....		2
2. Basal angles subacute and slightly prominent posteriorly; body moderately broadly oval; labrum with rather coarse punctures along the margin.....	<i>sinuatus</i> n. sp.	
Basal angles rectangular and subacute; body not broadly oval; labrum more abundantly punctate but less coarsely so along the margin.....	<i>tarsalis</i> n. sp.	

*A Revision of the American Components of the Tenebrionid Subfamily Tentyriinæ. (Proc. Wash. Acad. Science, Vol. IX, 1907.)

14. *Emmenides subdescalceatus* Blaisdell, new species

In *Emmenides* a peculiar and unique character is found in the feeble longitudinal elevation at each side of the elytral suture at the upper part of the apical declivity. The fifth ventral abdominal segment is modified at apex in the female. The

former character was observed by Col. Casey. The present species may be described as follows:

Form oblong, parallel, glabrous and shining, about 2 1/3 times longer than wide. Color, black with a slight piceous tint, more piceous beneath.

Head distinctly convex, very feebly, broadly and transversely impressed anteriorly; sides arcuately converging anteriorly, passing gradually into the arcuato-truncate apical margin; not very coarsely but deeply and rather closely punctate; punctures discrete centrally, confluent laterally and transversely so on the epistoma; intervals more or less longitudinally rugose; punctures smaller on the epistoma. Eyes more prominent than the sides of the front; supra-orbital carina short and not strong. Antennæ long and slender; joints elongate.

Pronotum about two-thirds wider than long, rather strongly convex; apex feebly sinuate; apical angles almost rectangular; sides broadly and evenly arcuate, rather strongly convergent anteriorly; base broadly arcuate in middle two-fourths, thence sinuate to the angles; the latter slightly obtuse and just a little rounded; disk densely punctate, punctures small, confluent laterally; intervals rather feebly longitudinally rugose.

Elytra oblong-oval, a little less than twice as long as wide, distinctly convex, moderately so antero-posteriorly; base subtruncate, somewhat arcuately rounded in lateral fourth, with the humeri obtuse and scarcely distinct; sides broadly but moderately arcuate; apex gradually and rather broadly parabolically rounded; disk abundantly and finely punctate; series feebly indicated; intervals very slightly convex on the apical declivity; subsutural elevations distinct when viewed from above in the plane of the declivity.

Propleura very sparsely punctate, punctures shallow and oval; longitudinal rugæ indicated. Abdomen sparsely punctate; punctures small. Legs rather densely punctate. Tarsi not densely pubescent beneath at apex.

Male: Rather narrower than the female. Fifth ventral segment rounded at apex.

Female: Rather broader. Fifth ventral rather broadly sinuato-truncate at apex.

Length (types) 8.5 to 9 mm.; width 3.3 to 3.8 mm.

A series of about 32 specimens was collected at Espiritu Santo Island, June 9; Ildefonso Island, May 17; and San Diego Island, May 27.

Type: Female, No. 1115, and *allotype*, male, No. 1116, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 9, 1921, on Espiritu Santo Island, Gulf of California. Paratypes in the Academy collection and in that of the author.

A small series of *punctatus* Lec., collected at Santa Rosa, Lower California, is before me. In these the tarsi are quite thickly pubescent beneath, the lateral surface of the pronotal

disk is less rugose and the punctures less confluent and not so elongate; the body is less convex and more parallel and the color more piceous. The fifth ventral segment in the female is briefly emarginate at apex and the edges of the emargination slightly bevelled, a character not mentioned by Horn or Casey.

15. *Emmenides apicalis* Blaisdell, new species

Similar in form to *subdescalceatus*, but less convex.

Head quite broadly sinuato-truncate at apex, rather short before the eyes; sides rather broadly arcuate and moderately convergent anteriorly. Eyes rather prominent.

Pronotum about two-thirds wider than long, widest slightly behind the middle; apex evenly and not deeply sinuate; angles subrectangular, scarcely rounded; sides quite evenly rounded, a little convergent anteriorly; base broadly arcuate at middle, sinuate laterally; angles obtuse and rather more than feebly rounded; disk rather more convex posteriorly, feebly impressed on each side along the sinuations, punctures small and sparse centrally, becoming longitudinally confluent laterally, with the intervals forming longitudinal rugæ; the latter not coarse; punctures in the vicinity of the basal angles each with a rather long yellowish hair.

Elytra nearly as in *subdescalceatus*, but less convex and rather gradually declivous posteriorly; parasutural elevations evident; humeri with a number of scattered hairs.

Propleura very coarsely punctured; punctures shallow and open anteriorly, their margins not very strong; surface rugose on the coxal convexities. Metasternal punctures coarse and moderately deep. Abdomen sparsely punctate; punctures not large; sides of the segment more or less rugose, punctures denser. Legs rather stout and moderately strongly sculptured.

Male: Fifth ventral segment broadly rounded and slightly truncate at middle.

Female: Fifth ventral segment strongly triangularly emarginate at apex; emargination equal to about two-fifths of the length of the segment; edges bevelled.

Length (types), 8 to 7.5 mm.; width 3.2 to 3 mm.

Ceralbo Island, seven specimens. The female type happens to be a little smaller than the male; a paratype of the same sex is about equal in size.

Type: Female, No. 1117, and *allotype*, male, No. 1118, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 7, 1921, on Ceralbo Island, Gulf of California. Paratypes in collection of the Academy and in that of the author.

Apicalis differs from *subdescalceatus* in its more shallow punctuation and much less convex form, besides the deep triangular emargination at apex of the fifth ventral segment of the female.

16. *Emmenides catalinae* Blaisdell, new species

Similar in form, color and sculpturing to *subdescalceatus* and fully as convex.

Head rather more convex. Pronotum rather longer; sides a little more convergent anteriorly and in the type somewhat straighter in front of the middle; a paratype has the sides more evenly arcuate; apical angles rather obtuse to subrectangular and a little rounded; basal angles obtuse and narrowly rounded; disk rather densely punctate; punctures sparser in the central area than nearer the lateral margins, those along the margin have yellowish hairs. Otherwise as in *subdescalceatus*.

Propleura punctato-rugose; punctures coarse, shallow, open at both ends more or less; surface rugose on the coxal convexities. Metasternal punctures coarse and quite deep. Abdomen sparsely punctate, quite so at the sides of the first two segments; punctures denser and stronger on fourth and fifth segments; sides more or less rugulose. Legs rather stout.

Female: Fifth ventral segment with a small rounded emargination which is about as wide as deep with its anterior margin bevelled.

Length 9 mm.; width 3.6 mm.

Santa Catalina Island, June 12; two females.

Type: Female, No. 1119, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 12, 1921, on **Santa Catalina Island, Gulf of California**. Paratype in collection of the author.

Catalinae is probably best separated by the form of the apical emargination of the fifth ventral segment of the female. In *apicalis* this emargination is largest and triangular; in *subdescalceatus* the fifth ventral is rather widely sinuato-truncate. In the male the same segment is broadly rounded at apex. In *punctatus* the fifth segment is very feebly sinuated and the surface feebly and rather transversely bevelled; the pygidium is triangularly prominent at middle posteriorly; in the male the fifth segment is broadly rounded at apex.

17. *Emmenides obsoletus* Blaisdell, new species

Obsoletus resembles some of the species of *Hylocrinus* rather than *Emmenides* but the frontal margin is not biemarginate and the tarsi are distinctly pubescent beneath. The

punctuation of the body beneath is quite shallow throughout and the fifth abdominal segment is less densely punctate; the angles of the pronotum are obtuse and slightly rounded; the form is less robust, more parallel and the elytra are less convex and are very gradually declivous posteriorly; the parasutural elevations are quite obsolete. The legs are rather slender.

The general sculpturing is the same as in *Emmenides* and differs only in degree that cannot be stated in words except as given above.

Three specimens are at hand, all collected at Marquer Bay, Carmen Island, May 23. All have the fifth ventral segment rounded at apex and sexual differences are not evident.

Length 7 mm.; width 2.9 mm.

Type: Sex undetermined, No. 1120, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 23, 1921, at Marquer Bay, Carmen Island, Gulf of California. Paratypes in the Academy collection and in that of the author.

A tentative synoptic table is presented below:

Parasutural elevations at summit of apical declivity distinct but not strong.....	1
Parasutural elevations obsolete; pronotal angles obtuse, basal slightly rounded; punctuation of under surface shallow; fifth ventral less densely punctate; sex doubtful; fifth ventral rounded at apex in specimens studied.....	<i>obsoletus</i> n. sp.
1. Fifth ventral segment in female quite deeply, triangularly emarginate at apex, in depth equal to about two-fifths the segmental length.....	<i>apicalis</i> n. sp.
Fifth ventral not deeply emarginate at apex.....	2
2. Fifth ventral segment in female subtruncate, very feebly emarginate at middle; adjacent surface more transversely bevelled; pronotal apical angles subacute.....	<i>punctatus</i> Lec.
Fifth ventral segment more distinctly emarginate.....	3
3. Fifth ventral in female truncate at apex, feebly and triangularly sinuate, situation as wide as deep.....	<i>subdescalceatus</i> n. sp.
Fifth ventral with the emargination as wide as deep and rounded at bottom, adjacent margin bevelled.....	<i>catalina</i> n. sp.

18. *Hylocrinus oblongulus* Casey

This species was described by Casey from specimens taken near San Diego, California. Eight specimens were secured by the Expedition, seven from the vicinity of Angeles

Bay, Lower California, and one from Lagoon Cove, Angel de la Guardia Island.

A large male measures 8 mm. in length and 3.5 in width. The form is elongate-oval and only moderately convex. The color is piceous to dark piceo-castaneous, beneath paler and more rufous; surface shining, luster somewhat dull. Head not strongly punctate, punctures shallow, sparse and discrete in middle area, becoming more or less coalescent laterally, intervals scarcely rugose. Pronotal disk not closely punctate in middle third where the punctures are small, becoming larger laterally, somewhat oval and more or less open posteriorly with the lateral margin of each prominent, otherwise the intervals are almost flat.

19. *Hylocrinus insularis* Blaisdell, new species

Form oblong-oval, parallel, moderately convex, about two and a third times longer than wide. Color piceous-black; beneath rufo-piceous; shining and glabrous.

Head very broadly and feebly impressed between the antennæ; punctures coarse, more or less coalescent in arcuate lines, discrete on the vertex and more evenly placed on the epistoma; the latter broadly truncate and at times feebly sinuate at apex; sides before the eyes evenly and rather broadly arcuate; supra-orbital carina not strong; eyes just a little more prominent than the sides of the front, not deeply emarginate. Antennæ long and slender, extending slightly beyond the pronotal base; ninth and tenth joints triangular and slightly longer than wide; eleventh obtusely oval and about a half longer than wide.

Pronotum about a half wider than long; apex not deeply sinuate in almost circular arc; angles subrectangular and blunt, not in the least prominent anteriorly; base arcuate in middle third, thence feebly and broadly sinuate to basal angles, the latter obtuse and moderately rounded; sides evenly, broadly and not strongly arcuate, moderately convergent anteriorly; disk rather evenly but not strongly convex, slightly and narrowly impressed at the basal situations; punctures well separated centrally, not very coarse, becoming more so laterally and coalescent; chiefly plicate in lateral fourth.

Elytra nearly twice as long as wide; base feebly sinuate at middle, becoming feebly and broadly arcuate laterally, equal to width of pronotal base; humeri obtusely rounded; sides not strongly but broadly arcuate to the subgival apex; disk with distinct striæ of small and unimpressed punctures, intervals flat with an irregular series of smaller punctures which may become confused at sides and on apex.

Propleura coarsely punctate; punctures shallow, more or less rugose on coxal convexities. Mesosternal epimera glabrous; twice as wide ex-

ternally as internally, with the posterior margin broadly sinuate. Punctures of under surface shallow. Abdomen glabrous and shining along the middle, duller laterally; punctures small, sparse and distinct centrally, slightly larger and more shallow laterally where the surface is more or less rugulose. Legs slender and moderate in length, with scattered short hairs. Metatarsi as long as the metatibiae.

Male narrower than the female.

Length (types), 6 to 6.5 mm.; width 2.1 to 2.3.

Marquer Bay, Carmen Island, May 23, 19 specimens.

Type: Male, No. 1121, and *allotype*, female, No. 1122, Mus. Calif. Acad. Sci., collected by E. P. Van Duzec, May 23, 1921, at **Marquer Bay, Carmen Island, Gulf of California**. Paratypes in collection of the Academy and in that of the author.

Insularis is narrower, more parallel with denser integuments than *longulus* Lec. or *blaisdelli* Casey, and the pronotal punctures are larger and more distinct with the body more convex. These three species undoubtedly are closely related but recognizable. In *insularis* the right mandible has a feeble dorsal tooth.

20. *Hylocrinus magnus* Blaisdell, new species

Form oblong, elongate-oval, somewhat depressed and much larger than *insularis*, resembling *oblongulus* Casey, from the vicinity of San Diego, California. It is about $2\frac{1}{2}$ times longer than wide. Color, piceous-black, more rufo-piceous beneath.

Head similar to *insularis* but more strongly rugose, rugæ arcuate, with a small area of discrete punctures on the vertex.

Pronotum transverse, fully two-thirds wider than long; apex not very feebly sinuate; apical angles rectangular and distinct; base distinctly arcuate in middle third, broadly and rather strongly sinuate laterally; sides evenly, broadly and not strongly arcuate, slightly convergent anteriorly, marginal bead rather strong and reflexed; disk more densely and strongly but similarly sculptured as in *insularis*.

Elytra nearly as in *insularis*. More strongly sculptured; striæ slightly impressed; punctures of the intervals more irregular and rather confused at base, sides and apex.

Propleura strongly and very coarsely punctate, rugose; sterna coarsely punctate; mesosternal epimera coarsely punctate. Abdomen sparsely, strongly punctate, punctures not very small; surface more or less rugulose laterally. Legs somewhat stout and rather strongly sculptured. Described from the unique type.

Length 8 mm.; width 3.5 mm.

Type: Female?, No. 1123, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 10, 1921, at **Guaymas, Sonora, Mexico.**

In *magnus* the sculpturing is stronger and the mesosternal epimera are coarsely punctate, while in *insularis* they are glabrous and impunctate. In form and size *magnus* resembles *oblongulus* Casey. In the latter species the mesosternal epimera are quite impunctate and the sides of the pronotal disk is almost discretely punctate and scarcely rugose while it is very strongly rugose in *magnus*. *Piceus* Casey is shorter and broader. *Magnus* probably belongs to the subgenus *Locrodes*.

21. *Steriphanus subopacus* Horn

A long series of this species was collected at the following localities: Isla Partida, July 1 and 2, April 22; Patos Island, April 23; Sal si Puedes Island, May 9; San Pedro Nolasco Island, April 17; San Lorenzo Island, June 24.

These specimens show considerable variation not only from the different islands but from the same region. These variations appertain chiefly to the degree of punctuation and impression of the elytral striæ; all necessary intermediates are present and therefore races cannot be defined.

Subopacus is dull in luster, wingless and elongate-oval in form, and moderately convex. Head coarsely and densely punctate. Pronotum coarsely and moderately densely punctured, more densely so at the sides; wider than long, narrowed in front; apex emarginate and base truncate; sides feebly arcuate from the base, angles obtuse. Elytral striæ distinctly punctured; intervals flat and smooth. Abdomen not coarsely but moderately punctured. The type locality is Fort Grant, Arizona. Length 7.2 mm.; width 3.25 mm. The species of *Steriphanus* are difficult of separation.

22. *Steriphanus alutaceus* Casey

Casey in the Canadian Entomologist for April 1910, page 110, states that this species probably is a slight racial variation of *subopacus* Horn. *S. peropacus* Casey has the same status.

A series of 29 specimens of this species was collected at localities visited as follows: Guaymas, April 15; Puerto Refugio, Angel de la Guardia Island, May 1.

Casey states that the integuments of this insect are feebly shining, strongly alutaceous and opaque. Head with close, deep and not very coarse punctures, finer and more dense on the epistoma. Pronotal disk sparsely and extremely minutely punctured, rather coarse laterally. Elytra with very fine punctures, widely spaced in unimpressed series, slightly larger toward the sides; intervals sparsely and excessively minutely and irregularly punctulate. Length 7.8 mm.; width 3.28 mm. Type locality Tucson, Arizona.

23. *Steriphanus torpidus* Blaisdell, new species

Form oblong-oval almost equally rounded at each extremity; a little more than twice as long as wide. Color piceous black, slightly pruinose-piceous beneath; legs dark rufous; labrum, mouth parts and antennæ lighter rufous. Punctuation strong.

Head rather small, densely punctate; punctures rather coarse, more or less coalescent with a few discrete punctures on the vertex; frontal margin arcuato-truncate; labrum densely and rather coarsely punctate. Eyes not prominent. Antennæ long and slender, joints elongate.

Pronotum about a half wider than long, evenly convex; apex broadly emarginate in almost circular arc; angles subrectangular; base very feebly lobed at middle; very broadly and feebly sinuate laterally; basal angles slightly obtuse, nearly rectangular; sides broadly and rather evenly arcuate, a little more strongly so and convergent in anterior half; disk closely punctate, punctures discrete at middle, larger, stronger and coalescent laterally; intervals longitudinally rugose laterally.

Elytra rather evenly convex at sides and apex; base equal to the pronotal base; humeri obtuse and distinct; sides broadly and evenly arcuate to apical third, thence more strongly so to the rather ogival apex; disk with very distinct rows of somewhat large and closely placed punctures; intervals with very sparse punctules which are rather more abundant at base and sides; striæ and punctures almost obliterated at apex.

Propleura very coarsely and deeply punctate; lateral margin of the punctures more prominent than the medial and open anteriorly. Sterna very coarsely punctate. Mesosternal epimera impunctate and rather narrow medially. Abdomen very sparsely punctate, punctures small, more abundant apically, coarse and sparse laterally on first three segments. Legs moderately short.

Length 7 mm.; width 3.1 mm.

Type: Sex undetermined, No. 1124, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 20, 1921, on **San Esteban Island, Gulf of California.**

Torpidus should be easily recognized by its dull luster, convex form, very distinct elytral striæ of strong punctures, rufous mouth parts and antennæ and the peculiar punctuation of the propleura.

24. *Steriphanus tardus* Blaisdell, new species

Form fusiform-oval, nearly twice as long as wide, moderately strongly convex. Color piceous, a little more rufous beneath; legs dark rufous; surface feebly shining.

Head quite closely and coarsely punctate; punctures more or less discrete centrally, more or less coalescent laterally; those on the epistoma somewhat smaller, densely placed and coalescent; sides broadly and rather evenly arcuate with the sides of the epistoma, the latter sinuato-truncate; emarginations at the oblique sutures small. Eyes not prominent; antennæ slender and elongate, extending beyond the pronotal base, outer joints very slightly wider.

Pronotum nearly twice as wide as long; apex rather strongly emarginate in circular arc, about half as wide as the base, apical angles obtuse; sides evenly arcuate from base to apex and distinctly convergent anteriorly; base feebly arcuate in middle third, thence feebly and broadly sinuate to the basal angles, the latter rather obtuse and almost slightly prominent posteriorly; disk sparsely and not coarsely punctate in the central area, toward the sides the punctures gradually become coarser and coalescent; intervals rather longitudinally rugose.

Elytra about a half longer than wide; humeri distinct; base equal to the pronotal base; sides broadly arcuate to the rather narrowly rounded apex; disk with distinct rows of closely placed punctures; punctures not very large; intervals flat with irregular series of small punctures.

Propleura very coarsely punctate; punctures oval, open anteriorly with the arcuate edges prominent. Sterna coarsely punctate. Mesosternal epimera with two or three punctures. Transverse ante-coxal metasternal line with a row of coarse punctures along its posterior margin. Abdomen sparsely punctate; punctures small, discrete, distinctly defined and more abundant on fifth segment; punctures rather coarse and sparse on sides of the first and second segments. Legs moderate in length; profemora rather stout.

Length 7.5 mm.; width 3.5 mm.

Type: Sex undetermined, No. 1125, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, April 19, 1921, on **San Esteban Island, Gulf of California.**

Tardus is distinct in its fusiform outline and distinct punctation which is very coarse on the under surface of the body; the sides of the pronotum are distinctly and strongly convergent from base to apex. It evidently belongs very close to Casey's *conicollis* which occurs in Arizona but the latter species is not fusiform in outline.

25. *Steriphanus mucronatus* Blaisdell, new species

Form elongate-oval, slightly more than twice as long as wide, moderately convex. Color dull black, dark piceous beneath; legs slightly rufous.

Head slightly convex, feebly impressed; epistoma slightly sinuate; sides of the front before the eyes rather strongly arcuate to the slightly evident oblique sutures; rather densely punctate, punctures moderate in size, somewhat discrete in the central area, elsewhere more or less coalescent; intervals not distinctly rugose; punctures of the epistoma smaller and dense, transversely coalescent. Labrum rather densely punctate, with a feeble median carina; apex feebly sinuate. Eyes feebly prominent. Antennæ long and slender, joints rather elongate.

Pronotum about a half wider than long; apex feebly sinuate in almost circular arc; apical angles obtusely rectangular and not in the least prominent; base feebly arcuate in middle third, thence broadly and feebly sinuate to the angles, the latter obtuse; sides rather strongly convergent anteriorly to apex, very moderately arcuate, bead moderate; disk strongly convex; punctures rather dense, smaller and discrete centrally, becoming slightly larger and rather elongate laterally where they are coalescent; intervals forming moderate longitudinal rugæ.

Elytra about a third longer than wide; base somewhat sinuate laterally, just a little wider than pronotal base, humeri obtuse; sides broadly arcuate to the rather broadly ogival apex; disk with distinct unimpressed striæ of rather strong, closely placed, punctures; intervals with sparsely distributed and very minute punctules.

Propleura coarsely rugoso-punctate; prosternum coarsely and discretely punctate; process very convex between the coxæ but upwardly reflexed and then briefly deflexed and more or less mucronate. Mesosternum and its episternum coarsely punctate; epimera quite impunctate. Metasternum coarsely and irregularly punctate as well as the episterna; transverse ante-coxal line with a row of punctures against its posterior edge. Abdomen sparsely punctate; punctures small throughout the central area; denser on fifth segment; a little larger and sparser on the sides of the first two segments. Legs moderate.

Length (type), 7.5 mm.; width 3.4 mm.

Freshwater Bay, Tiburon Island, three specimens.

Type: Sex undetermined, No. 1126, Mus. Calif. Acad. Sci., collected by Jos. R. Slevin, April 23, 1921, at Freshwater Bay,

Tiburon Island, Gulf of California. Paratypes in collection of the Academy and in that of the author.

In *mucronatus* the mentum is rather densely punctate and the punctures are transversely coalescent at apical third, with the intervals transversely rugose at that point; at the sides anteriorly there is a row of about three to five rather long setæ.

26. *Steriphanus durus* Blaisdell, new species

Form oblong-oval, strongly convex; slightly more than twice as long as wide. Color piceous-black; beneath dark rufo-piceous; legs dark rufous. Surface glabrous and shining.

Head densely and coarsely punctate; punctures shallow, more or less coalescent; intervals forming feeble rugæ that are more or less arcuate; small area on vertex with discrete punctures, those of the epistoma smaller and more or less transversely coalescent; front slightly convex, broadly and feebly impressed anteriorly; frontal margin arcuato-truncate; oblique sutures rather distinct. Eyes not prominent. Antennæ long and slender.

Pronotum scarcely a half wider than long, strongly convex; apex not strongly sinuate, in almost circular arc; apical angles narrowly rounded and subrectangular and not in the least prominent anteriorly; base about a third wider than apex, very feebly arcuate at middle, feebly and broadly sinuate laterally; basal angles subrectangular; sides evenly and rather feebly arcuate, moderately convergent anteriorly; disk evenly punctate in central area; punctures rather small and discrete, becoming gradually larger toward the sides, somewhat coalescent; lateral margin of each puncture forming an arcuate plicature, scarcely forming longitudinal rugæ.

Elytra suboblong-oval, not wider than pronotum at point of greatest width; base equal to pronotal base; humeri obtuse and distinct, not in the least prominent; sides broadly and evenly arcuate to the subgival apex; disk with fine and distinct striæ of small punctures; intervals with a single irregular series of fine punctules which are more or less confused on apex.

Propleura with very large, shallow and elongate punctures which are open anteriorly, margins forming plicatures. Sterna coarsely punctate. Mesosternal epimera impunctate. Abdomen sparsely punctate; punctures rather large and rounded, distinctly defined, rather evenly distributed centrally, more abundant on fifth segment, larger at sides of first three segments. Legs moderately stout.

Length 6.9 mm.; width 3 mm.

Type: Sex undetermined, No. 1127, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, May 7, 1921, at Angeles Bay, Lower California.

Durus at first sight resembles *lubricans* Casey, from which it differs in the distinctly striate elytra, less densely punctured labrum, less arcuate sides of pronotum, plicatulate sides of the latter and larger, shallow and elongate punctures of the propleura. In *lubricans* the sides of the pronotal disk are longitudinally rugose. In *discrepans* Casey the propleural punctures are smaller, less evident between the rather coarse longitudinal rugæ. *Durus* also differs from any described here in the shining and glabrous integuments.

27. *Steriphanus estebani* Blaisdell, new species

Form oblong subfusiform-oval, a little more than twice as long as wide, moderately convex. Color piceous, beneath dark rufo-piceous; legs dark rufous; surface feebly shining, dull and rather alutaceous.

Head rather small, sparsely and discretely punctate in the central area; punctures not strong laterally, rather shallow, somewhat coalescent; intervals forming feeble arcuate rugæ; punctures of epistoma less dense and less coalescent than usual, scarcely at all rugose; labrum with rather closely placed and finer punctures; sides arcuate laterally; epistoma sinuato-truncate; punctures small and discrete on the sides before the eyes, the latter not prominent. Antennæ long and slender.

Pronotum about twice as wide as long, moderately and evenly convex; apex not strongly sinuate, in almost circular arc; angles rectangular and not in the least rounded; base at least a third wider than apex, rather feebly and broadly arcuate or very slightly sinuate laterally; basal angles quite rectangular, just the least rounded at tip; sides slightly and broadly arcuate, convergent anteriorly; disk finely and discretely punctate in central area from apex to base, the punctures becoming gradually slightly larger laterally; extreme sides longitudinally strigose where the punctures are scarcely evident.

Elytra at least three times as long and slightly wider than the pronotum; base equal to pronotal base; humeri obtuse and distinct; sides evenly and broadly arcuate to the parabolically rounded apex; disk with distinct striæ of small punctures, intervals with an irregular series of fine punctules which become more or less confused laterally and on the apex.

Propleura coarsely, subsparately sculptured, punctato-rugose; punctures rather coarse on the sterna, smaller and sparser on the side pieces. Abdomen sparsely and not coarsely punctate; punctures denser on fifth segment, noticeably a little coarser at the sides, especially on first segment. Legs moderate in length.

Length 7 mm.; width 3 mm.

San Esteban Island, two examples. A third specimen taken at Tepoca Bay, April 25, is doubtfully referred to this species.

Type: Male, No. 1128, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 20, 1921, at **San Esteban Island, Gulf of California.**

In *estebani* the punctuation of the under surface of the body is rather subasperate, not strong and somewhat shallow. The species is less convex than *durus*.

The species of *Steriphanus* resembles each other in general appearance but careful comparison without prejudice will determine that comparatively slight difference in sculpturing are constant in specimens from the same locality as from the different islands or from the mainland. While some of the species have been described from single specimens and may call forth a certain amount of criticism it will not change my opinion regarding their validity or the fact that I could not conscientiously consider them identical.

28. *Melanastus obscurus* Blaisdell, new species

Form oblong-oval, a little more than twice as long as wide, moderately strongly convex. Color black; beneath, antennæ, and legs, dark rufous.

Head slightly wider than one-half the width of the pronotum, moderately convex; broadly, feebly and transversely impressed between the sides of the front anterior to the eyes; sides evenly arcuate with the sides of the epistoma, the latter sinuato-truncate; rather evenly punctate; punctures moderate in size, well separated on front of vertex and at base of epistoma, laterally more or less longitudinally coalescent; intervals becoming feeble rugæ. Eyes not prominent. Antennæ extending to about the basal fifth of the pronotum.

Pronotum about a third wider than long, rather strongly convex; apex moderately sinuate; apical angles about rectangular, not in the least rounded; sides rather evenly and very feebly arcuate, more convergent anteriorly, marginal bead distinct and moderately strong; base arcuate in middle third, broadly sinuate laterally, a little wider than the apex; basal angles almost rectangular, narrowly rounded; disk sparsely punctate in middle third; punctures rather small, becoming gradually larger and longitudinally coalescent laterally; intervals forming longitudinal rugæ.

Elytra oblong-oval, scarcely twice as long as wide; base equal to pronotal base; humeri obtuse, distinct but not in the least prominent; sides feebly arcuate in basal two-thirds, thence more strongly arcuate to the subgigival apex; disk with unimpressed striae of fine and closely placed

punctures; intervals flat, finely sparsely and almost uniserially punctured; all punctures slightly stronger laterally; each interstitial puncture with a small recumbent pale hair.

Beneath very coarsely punctured, especially on the propleura. Abdominal punctures finer and sparser at middle, coarse and sparse on sides of first segment. Legs moderate in length and not stout.

Male narrower than female.

Length (types), 6.6-7.3 mm.; width 2.5-3.2 mm.

Guaymas, April 10, 12, and 13, nineteen specimens.

Type: Male, No. 1129, and *allotype*, female, No. 1130, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 10, 1921, at **Guaymas, Sonora, Mexico**. Paratypes in collection of the Academy and in that of the author.

Obscurus is separated from species of *Steriphanus* by the shorter and stouter antennæ, broadly arcuato-truncate and entire frontal margin; eighth antennal joint as long as wide, eyes emarginate. In *Steriphanus subopacus*, *alutaceus*, *durus* and *torpidus* the eighth antennal joint is distinctly elongate. This is the only species of *Melanastus* taken by the expedition. *Sonoricus* Casey taken near Colonia Garcia, Chihuahua, Mexico, is smaller and stouter. It may be considered hazardous to define a new species of *Melanastus* when there are so many of Casey's unknown to our collections but after a careful study of the present material I decided upon the present course.

TRIMYTINI

29. *Trimytis obtusa* Horn

A considerable series was taken at the following localities: Ceralbo Island, June 7; Puerto Ballandra, Carmen Island, May 21; Marquer Bay, Carmen Island, May 23; Espiritu Santo Island, June 9; Conception Bay (Coyote Bay), June 18. In this small species the pronotal angles are obtuse. It was described from Sierra Laguna. Three specimens are before me which were collected at Santa Rosa, Lower California.

30. *Trimytis (Pimalius) subsenilis* Blaisdell, new species

Form oval, slightly elongate, slightly more than twice as long as wide, strongly convex. Color piceous brown; an-

tennæ and under surface slightly rufous; dull in luster; each puncture with a short decurved, inconspicuous ashy hair.

Head strongly rugose; punctures coarse and elongate between the rugæ, which on each side of the head begin at the occiput and converge to the deep emargination between the lateral lobe of the side and base of the epistoma; the emargination about as deep as wide and rounded at bottom; epistomal lobe well developed, deflexed and arcuate at apex, edges dentato-crenulate, surface very deeply, coarsely punctate and reticulate apically, transversely rugose at base. Mandibles coarsely punctate above with a well developed porrect tooth. Lateral lobes of the front arcuate from the emargination, less so and divergent toward the eye. Antennæ rather stout; outer five joints somewhat compressed, tenth wider than long; eleventh slightly transversely oval.

Pronotum rather transversely oblong, base about a fifth wider than apex; strongly convex from side to side, feebly so antero-posteriorly; apex rather arcuate centrally, becoming slightly sinuate laterally within the slightly prominent and obtuse angles; sides evenly arcuate, rather convergent anteriorly; base broad and not strongly arcuate at middle, broadly so laterally; basal angles sharply rectangular and rather prominent posteriorly; disk regularly and rather coarsely punctate, punctures not strongly impressed; intervals tending to become longitudinally prominent apically and basally; laterally the punctures become coarser, not confluent, with the intervals raised and forming a reticulum.

Propleura and prosternum coarsely punctate; punctures of the former less impressed.

Elytra oblong-oval; base truncate, humeri obtusely rounded; sides evenly and not strongly arcuate, quite so in apical third; apex rather broadly rounded; disk rather abruptly arcuately declivous posteriorly, with rows of widely spaced punctures which are feebly impressed; intervals flat, very sparsely and irregularly punctulate.

Abdomen extremely sparsely and finely punctate; sutures impressed. Legs moderately short.

Length (type), 4.5 mm.; width 2 mm.

Guaymas, April 7, 8, and 15.

Type: Sex undetermined, No. 1131, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 7, 1921, at Guaymas, Sonora, Mexico. Paratypes in collection of the Academy and in that of the author.

In *obtusa* the head is feebly sculptured as compared with *subscnilis*. In the subgenus *Pimalius* Casey, the mandibles have a porrect dorsal tooth. Two species of *Trimytis* (*obovata* Champ. and *flohri* Champ.) are given in the *Biologia* as occurring at Chihuahua City. It is stated that the former is closely related to *pruinosa* Lec., and the latter to *pulverea* Horn.

Genus CHILOMETOPON Horn

Casey's definition of this genus may be quoted here on account of the somewhat doubtful relationship of the described species.

"Body elongate, convex, glabrous, winged; the metasternum with transverse grooves; eyes large, prominent and very feebly emarginate anteriorly; tarsi long, basal joint of the posterior variable; prothorax always narrowed toward base and widest before the middle. Last antennal joint elongate, sometimes extremely so." None of Casey's new species are at hand nor is *abnorme* Horn available. Three species that I refer to this genus are before me, each represented by a single specimen, one of which was collected on the Mohave Desert between Dagget and Needles. The following two seem to be undescribed:

31. *Chilometopon rugiceps* Blaisdell, new species

Form elongate-ovate, widest behind the middle, narrowing anteriorly, a little more than twice as long as wide. Color castaneous, feebly shining.

Head relatively small; epistoma abruptly lobed; sides converging and round at apex, surface more or less rugose; emarginations shallow and rounded at bottom, lateral lobes small and passing into the rather broadly arcuate sides of the front before the eyes; front broadly impressed between the supra-antennal convexities, the latter antero-posteriorly arcuate from the eye and continuing the upper plane of the mandible; surface rather evenly and closely punctate; punctures oval and discrete on vertex, becoming elongate anteriorly, the intervals raised into feeble longitudinal rugulæ that stream and converge from the vertex and sides to the frontal emargination on each side; supra-orbital carina distinct; surface between it and the emargination quite impunctate. Eyes large and prominent. Antennæ long and slender; terminal joint at least as long as the preceding three combined.

Pronotum rather more than twice as wide as long, quite evenly and moderately convex; apex broadly arcuate, sinuate laterally within the angles which are but slightly prominent anteriorly and obtuse; base arcuate at middle and broadly sinuate laterally to the angles, the latter rather sharply rectangular; sides broadly and rather strongly arcuate, somewhat straight and converging posteriorly to the angles; disk very slightly and broadly depressed in region of basal angles; punctures rather large, shallow and open posteriorly, larger laterally where the intervals are rather prominent but flat adjacent to the sides.

Elytra one-half longer than wide, somewhat oval, slightly widest behind the middle; base slightly emarginate in middle third; arcuate lat-

erally conforming to the pronotal base; humeri broadly exposed, rounded; sides broadly arcuated to apex, the latter obtusely rounded; disk moderately convex, not very strongly deflexed at sides, feebly prominent at humeri; punctures small, rather irregularly placed, series obscurely indicated.

Propleura coarsely punctate, the punctures round and shallow; coxal convexities glabrous and impunctate. Abdomen evenly convex, finely and sparsely punctured; each puncture with a small yellow seta; two rows of ambulatory setae are present, the terminal two setae of each series longer on fifth segment. Mesosternal episterna very coarsely punctured; epimera smooth and impunctate. Legs rather slender. Described from the unique type.

Length (type), 5 mm.; width 2 mm.

Type: Male, No. 1132, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 26, 1921, at Angeles Bay, Lower California.

Rugiceps agrees with *ensifer* Casey in the long terminal antennal joint in the male, the basal joint of the metatarsi, however, is but slightly longer than the fourth; the epistomal lobe is rounded as in *ensifer*, in *pallidum* Casey that lobe is arcuato-truncate and the basal metatarsal joint is as in *rugiceps*. These insects appear to be rare and no one seems perfectly sure regarding specific characters.

32. *Chilometopon cribricolle* Blaisdell, new species

Form similar to *rugiceps*, but slightly stouter and rather more convex. Color somewhat chestnut-brown; under surface slightly rufous; legs castaneous.

Head nearly as in *rugiceps*; epistomal lobe arcuato-truncate at apex; rather strongly convex, punctate, with a small impunctate area at middle of vertex. Eleventh antennal joint oval, about twice as long as wide.

Pronotum almost as in *rugiceps*, about twice as wide as long; apex slightly arcuate; angles obtuse and distinct; sides broadly arcuate; disk somewhat strongly declivous at apical angles, rather strongly punctate. A slight median line is present.

Elytra nearly as in *rugiceps*; punctures finely asperate, denser about base; irregular at base, along the suture, at sides and apex, but for the most part in closely placed series.

Propleura coarsely and rather strongly punctate; coxal convexities rugulose. Sterna punctured as in *rugiceps* but rather more strongly. Abdomen finely and sparsely punctate; punctures quite strong on last two segments.

Length (type), 5.3 mm.; width 2.4 mm.

San Nicolas Bay, May 16, J. C. Chamberlin.

Holotype, female, No. 1133, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, May 16, 1921, at San Nicolas Bay, Lower California.

EPITRAGINI

33. *Metopoloba densiventris* Casey

In Horn's list of the "Coleoptera of Baja California", *Epitragus pruinosus* Horn is listed as occurring in Texas, Arizona, southern California and San José del Cabo. In 1907, Col. Casey revised the "American Components of the Tenebrionid subfamily Tentyriinæ" and divided up the species quite extensively, and apparently separated what had previously been referred to *pruinosus* into several new species, none of which was mentioned as occurring in Lower California. Careful study of Col. Casey's views regarding the characterization of the phases related to Horn's *pruinosus* leaves much confusion in my mind as to the real status of the species. A series of eight specimens was collected by Mr. Van Duzee at the following places: Guaymas, April 10; San Carlos Bay, July 8, and Tiburon Island, July 4 and 5. In following Casey's tabulation of characters they apparently are to be considered as *densiventris* Casey, and *pruinosus* Horn appears to be separable from it. A large series from the different geographical regions are necessary to settle the confusion.

TRIOROPHINI

34. *Triorophus lævis* LeConte

A large series taken at Guaymas, April 10, on Georges Island, April 26, and Patos Island, April 23, answer to the specific definition of *lævis* Lec. The elytra series of punctures are obsolete only slightly behind the middle; the tenth antennal joint is quite as wide as long, the pronotal punctures are of one size, and the surface is shining. My large series is from the Colorado Desert and southwestern Arizona.

TRIPHALOPSIS Blaisdell, new genus

Type: *Triphalopsis partida* Blaisdell, new species

Epistomal lobe rather large and obtusely triangular; front of head strongly rugose; mandibles with a porrect dorsal tooth, smaller on left side, mandible not swollen at base, superior surface flat and about as wide as length of second antennal joint; at tip unequally bifid, upper lobe longer than the lower and smaller lobe. Eyes moderate in size, not prominent, moderately emarginate anteriorly by side of the front, scarcely transverse and coarsely faceted. Antennæ moderately long and slender. Body clothed with rather long hair which is fine and pale in color. Pronotum margined at sides. Elytra slightly inflated; series of punctures entire. Epipleura moderately narrow and gradually narrowing from base toward apex. Legs moderately short, rather slender; tarsi with coarse spiniform hairs which are closely placed at the apical margin of the joints beneath; first tarsal joint as long as the fourth. Body coarsely punctured beneath.

In color and pubescence it resembles at first sight *Amphidora littoralis*, but the elytra are more inflated and the form is more like *Triphalus cribricollis* Horn. The epistomal lobe is larger and longer than in *Triphalus* which it resembles in the coarse punctuation of the under surface; epipleura similar.

In *Oxygonodera* Casey, the facies is more like *Triorophus* and the apical angles of the pronotum are prolonged as in *Edrotes*.

In *Trichiotes* Casey, the epistomal lobe is as in *Micromes* Casey; the general form and sculpturing resembles *Triorophus* but it is sparingly clothed with long erect hair and the eyes are not emarginate anteriorly. There appears to be nothing like this new form mentioned in the *Biologia*.

Pescennius villosus Champ. is clothed with short yellowish decumbent hairs and is without close relationship with *Triphalopsis*; it is a member of the *Trimytini*.

Two species of *Triphalopsis* are apparently represented in the material before me and are to be characterized as follows:

35. *Triphalopsis partida* Blaisdell, new species

Form ovate; elytra somewhat inflated, resembling *Triphalus cribricollis* Horn, but sparsely clothed with rather long, soft hairs that are erect and decurved at tip. Color piceous brown; legs slightly rufous.

Head coarsely rugose, the rugæ on each lateral half begin at the occiput and converge anteriorly to the notch at base of the mandibles; rugæ long and strong, the sulci between with coarse elongate punctures; epistoma transversely rugose, at base of which and between the diverging rugæ of each side is a triangular punctate space; supra-orbital carina well developed and nearly attaining the mandibular base; supra-antennal convexity simply punctate, punctures moderate and not strong. Antennæ long and slender; third joint at least twice as long as second, third to fifth elongate, sixth to ninth distinctly longer than wide, tenth triangular and as long as wide.

Pronotum transversely oblong, strongly convex from side to side; apex truncate in circular arc; angles acute, small and feebly divergent; sides feebly and evenly arcuate and beaded; basal angles obtuse; base slightly arcuate and rather sinuate laterally; disk coarsely rugoso-punctate.

Elytra oval, strongly convex; base almost truncate and equal to pronotal base; humeri small, obtuse and not in the least prominent; sides broadly and moderately strongly arcuate; apex feebly lobed and moderately narrowly rounded; disk arcuately and abruptly declivous posteriorly; punctures moderate in size, arranged in close series, both strial and interstitial equal in size; strial punctures separated by a distance equal to their diameter; interstitial about twice as widely separated, scarcely confused at sides and on apex.

Under surface very coarsely punctate, quite densely so on the sterna; abdomen shining and more sparsely and less coarsely punctured; fifth segment comparatively small; fourth about one-half the length of third. Sexual characters not evident except that males are usually smaller.

Length (types), 5.3-6.3 mm.; width 1.9-3.2 mm.

A considerable series was taken at the following localities: Isla Partida, April 22; San Lorenzo Island, May 9; Freshwater Bay, Tiburon Island, April 23; Patos Island, April 23; and Mejia Island, April 30. A very interesting and easily recognized species.

Type: Female, No. 1134, and *allotype*, male, No. 1135, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 22, 1921, on Isla Partida, Gulf of California.

36. *Triphalopsis minor* Blaisdell, new species

Similar in form and sculpturing to *partida* but smaller and less strongly punctured; mandibles less strongly bifid; rugæ of front of head less coarse and not so strong on vertex; elytra rather less convex.

Length (types), 5.5-6.5 mm.; width 2.5-3 mm.

South Santa Inez Island, May 13, a good series; Pond Island and Pond Island Bay, Angel de la Guardia Island, July 1; Angeles Bay, May 5.

Type: Female, No. 1136, and *allotype*, male, No. 1137, collected by E. P. Van Duzee, May 13, 1921, on **South Santa Inez Island, Gulf of California**. Mus. Calif. Acad. Sci. Paratypes in the Academy collection and in that of the author.

It may be noted that the pronotal disk is less strongly punctured in the central area, the punctures being separated and the intervals flat.

37. *Triphalus subcylindricus* Blaisdell, new species

Form elongate-subcylindrical, scarcely inflated. Color piceous to nigro-piceous; legs slightly paler; shining, quite glabrous and not pubescent.

Head coarsely, closely and more or less confluent punctate; rather broadly impressed within the supra-antennal convexities; punctures on the epistoma more or less transversely coalescent; superior surface of the mandibles not strongly punctate. Antennæ long and slender.

Pronotum about a fourth wider than long; very strongly and cylindrically convex from side to side; base subequal to or slightly wider than apex, the latter truncate in circular arc; apical angles almost rectangular, not in the least prominent; sides feebly arcuate from base to apex, beaded; base feebly arcuated and beaded from angle to angle; basal angles obtuse and distinct; disk coarsely and more or less confluent punctate; intervals almost forming longitudinal rugæ. Scutellum forming part of the raised elytral base.

Elytra less than a half longer than wide, nearly evenly oval, cylindrical, not inflated, widest at middle; base very feebly emarginate and equal to pronotal base; humeri obtuse, small and distinct; sides broadly and evenly arcuate; apex rather broadly rounded; disk cylindrically convex, evenly and rather gradually arcuately declivous posteriorly, with nine discal, apically impressed, entire and regular rows of moderately large, closely spaced punctures; intervals with two series of widely spaced, slightly irregular, finely muricate punctules, each with a short inconspicuous hair.

Under surface very coarsely punctured. Males evidently narrower than females.

Length (types), 7-7.5 mm.; width 2.9-3 mm.

San Diego Island, May 27, two specimens; Ceralbo Island, June 6, two specimens.

Type: Male, No. 1138, and *allotype*, female, No. 1139, collected by E. P. Van Duzee, May 27, 1921, on **San Diego Island, Gulf of California**. Mus. Calif. Acad. Sci. One para-

type in collection of the Academy and one in that of the author.

Subcylindricus is more shining and the elytra are less coarsely punctate and not inflated. *Perforatus* Lec. is alutaceous in luster, elytra very coarsely and perforately punctate and more or less inflated, often widest behind the middle. Both *subcylindricus* and *perforatus* have very minute hairs arising from the punctures. *Cribricollis* Horn is rather shining with distinct sparse vestiture of longer (although short) suberect and somewhat coarse, fulvous hairs. Head densely punctato-strigose.

A specimen of *cribriollis* from San José del Cabo, Lower California, the type locality, is before me; also three specimens of *perforatus* Lec., one taken in the same region as *cribriollis*, the others at La Paz.

ORTHOSTIBIA Blaisdell, new genus

Type: Orthostibia frontalis Blaisdell, new species

Form nearly as in *Stibia*; epistomal lobe not deflexed, rather short and arcuate at apex; mandibles with a porrect dorsal tooth; tarsi spinose beneath, with apical spiniform hairs; first joint of metatarsi as long as third and fourth combined; eyes emarginate anteriorly; supra-antennal carina well developed; elytra oval, at most but feebly inflated. Intercoxal process of the abdomen moderate in width and truncate. Epipleura gradually narrowing from the humeri toward the apex, somewhat concave at base.

In *Stibia* the epistomal lobe is strongly deflexed, the line forming the upper margin of the deflexed portion continuous with the sides of the front when viewed from above.

In *Triphalus* the epistomal lobe is not deflexed, triangular, and at its sides obtusely dentate; pronotum cylindric in form and basal joint of the metatarsi somewhat shorter than the fourth.

In *Micromes* the body is small in size; elytra with confused punctuation with the epistoma as in *Triphalus*. In *Trichiotes* and *Oxygonodera* the body is pubescent. *Orthostibia* is intermediate between *Stibia* and *Triphalus*.

38. *Orthostibia frontalis* Blaisdell, new species

Form elongate-ovate, a little more than twice as long as wide. Color black, alutaceous and feebly shining; antennæ and legs dark rufo-piceous.

Head feebly convex, epistoma noticeably so; front trilobed by the sides and epistoma, emarginations not deep, rounded at bottom; surface impressed within the supra-antennal convexities; coarsely punctate, punctures discrete, a little smaller on the epistoma and sides before the eyes, the latter emarginate and not prominent. Antennæ long and slender, extending beyond the pronotal base; joints elongate, ninth and tenth triangular, eleventh oval, about a half longer than wide.

Pronotum about a fourth wider than long, moderately convex; apex moderately and broadly emarginate; apical angles short, acute and anteriorly prominent; sides almost evenly and less than moderately arcuate, bead small; base equal to the apex, arcuate in middle three-fourths, feebly sinuate laterally and extremely feebly impressed within the bead; basal angles obtuse and distinct; disk moderately coarsely punctate, punctures coarse laterally, rounded and discrete; intervals nearly flat.

Elytra oval; moderately strongly convex and arcuately declivous posteriorly, about two-thirds longer than wide; base feebly emarginate, equal to pronotal base; humeri obtuse, distinct and not in the least prominent; sides broadly and evenly arcuate, margin slightly reflexed apically; apex slightly lobed and moderately narrowly rounded; disk with regular series of rather coarse punctures, the latter separated by a distance equal to their width, slightly impressed laterally and on apical declivity; intervals flat on the dorsum, feebly convex laterally and on apex, first and second flat to apex, all with widely scattered extremely small punctules, each with a minute decumbent hair.

Beneath coarsely punctate; abdomen rather finely and sparsely punctate, punctures along base of first segment rather coarse, especially at the process. Legs moderately slender and not densely sculptured.

Length (types), 7-8.3 mm.; width 3.2-3.5 mm.

Espiritu Santo Island, 25 specimens.

Type: Female, No. 1140, and *allotype*, male, No. 1141, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 9, 1921, on **Espiritu Santo Island, Gulf of California**. Paratypes in Academy collection and in that of the author.

This interesting species appears sufficiently distinct from *Stibia* in the form of the epistomal lobe and the narrowly margined sides of the pronotum. All specimens and species referable to *Stibia* have a porrect dorsal mandibular tooth as in *Orthostibia*.

39. *Stibia puncticollis* Horn

A long series of this species was taken at the following localities: Loreto, May 20; Ceralbo Island, June 7; Monserrate Island, June 13 and San Carlos Bay, July 8.

This is the only species of *Stibia* taken on the main land of the peninsula by the expedition, and it answers the description given by Dr. Horn and repeated by Col. Casey: "Ferruginous-brown (to black), shining (to dull in luster); head coarsely confluent punctate; pronotal sides acute and not thickened." The mandibles in *Stibia* have a perfect dorsal tooth as Col. Casey surmised, at least all specimens I have seen or examined or referred to the genus *Stibia* have perfect dorsal mandibular teeth. These teeth are often very difficult to see when closely adducted against the sides of the labrum. The species cannot be referred to any other genus and several new ones are at hand.

40. *Stibia sparsa* Blaisdell, new species

Form elongate-ovate, resembling *Triorophus* at first sight. Color brownish ferruginous to black, shining and glabrous; antennæ almost rufous; legs rufo-piceous.

Head coarsely and almost discretely punctate; sides of front with base of the deflexed epistoma forming a distinct acutely rounded ridge; adjacent surface of the front strongly impressed, causing this region to resemble the clypeus of certain scarabæids. Antennæ long and slender, joints elongate.

Pronotum about a third wider than long, moderately strongly convex; apex feebly and evenly emarginate between the acutely rectangular apical angles; sides rather strongly arcuate, somewhat convergent toward the base and straight or very feebly sinuate, margin thickened and more or less obtusely rounded; base evidently slightly wider than the apex, broadly and feebly lobed in rather more than middle two-fourths, thence feebly sinuate to basal angles, marginal bead coarse and reflexed at the arcuation; basal angles obtuse; disk narrowly impressed along the thickened margin and linearly so within the basal bead; surface rather sparsely and not very coarsely punctate; punctures small, discrete and very sparse in region of apical angles.

Elytra quite evenly oval, scarcely twice as long as wide; base quite equal to the pronotal base, humeri obtuse, distinct, and not in the least prominent; sides evenly and broadly arcuate to the rather narrowly rounded and subgival apex; disk almost evenly convex from side to side, slightly flattened on dorsum with nine rows of strong punctures there and a short scutellar row of about three punctures; series feeble on extreme apex; intervals scarcely convex at sides and apex, with

widely scattered, extremely minute punctules, each bearing a decumbent, pale minute hair.

Propleura coarsely punctate, punctures shallow and well separated. Sterna and sides coarsely punctate. Abdomen with rather small punctures which are denser and coarser on fifth segment, fine and sparse at sides.

Male: First abdominal segment with a rounded pubescent fovea on base of intercoxal process.

Length (types), 8-8.5 mm.; width 2.9-3.5 mm.

A considerable series was collected at the following places: South Santa Inez Island, May 13; Angeles Bay, May 5 and 7; Sal si Puedes Island, May 9; San Lorenzo Island, June 24; Isla Partida, July 2; and Tortuga Island, May 11.

Type: Female, No. 1142, and *allotype*, male, No. 1143, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 13, 1921, on **South Santa Inez Island, Gulf of California**. Paratypes in Academy collection and in that of the author.

Specimens from Santa Inez Island and Angeles Bay are quite identical in all their characters while those from Isla Partida, San Lorenzo Island and Tortuga Island offer variations. At present I do not care to consider these variations as of varietal or specific value.

41. *Stibia granulata* Blaisdell, new species

Form elongate-subovate, slightly more than twice as long as wide; color opaque black; legs dark rufo-piceous; antennæ, palpi and tarsi rufous. Surface throughout microscopically granulate.

Head moderately coarsely punctate; punctures separate, quite evenly distributed; surface with minute asperities; sides of front and base of the deflexed epistoma quite strongly and obtusely rounded; adjacent surface transversely impressed. Antennæ long and slender; third joint twice as long as second.

Pronotum about a fourth wider than long, moderately and rather evenly convex; apex broadly emarginate, slightly oblique within the angles which are anteriorly prominent and acute; sides evenly and not strongly arcuate, slightly less so toward the angles, margin obtuse, not thickened; base arcuate and slightly lobed, rather broadly sinuate laterally, bead rather small; basal angles almost subacute; disk scarcely in the least impressed along the sides, densely punctate; punctures rather large and more or less confluent; a feeble median impunctate line indicated.

Elytra oval; base feebly emarginate, equal to pronotal base; humeri obtuse and almost distinct; sides broadly and evenly arcuate; apex rather narrowly rounded and subgigival; disk moderately evenly convex, finely and minutely asperately granulate; striæ of small punctures obscurely indicated; intervals flat on dorsum, becoming obtusely and slightly convex laterally and on apical declivity where they appear feebly costulate when viewed from behind.

Propleura and sterna very coarsely and perforately punctate. Abdomen rather finely and sparsely punctate; punctures dense on fifth segment, coarse on intercoxal process; more or less corroded. Legs rather slender; anterior slightly thickened, more densely sculptured.

Length (type), 8.5 mm.; width 3.7 mm.

Santa Catalina Island, five specimens.

Type: Possibly a male, No. 1144, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 12, 1921, on **Santa Catalina Island, Gulf of California**. Paratypes in Academy collection and in that of the author.

A very distinct species. Easily recognized by the opaque integuments, microscopically granulate surface and coarse perforate punctures of the sterna. If the type is a male it is without an abdominal pubescent fovea.

42. *Stibia cribrata* Blaisdell, new species

Form elongate-ovate, a little more than twice as long as wide, not noticeably inflated. Color dull black; antennæ, palpi and legs dark rufous.

Head coarsely and strongly punctate; punctures quite discrete, slightly smaller on epistoma and supra-antennal convexities; raised base of the deflexed epistoma very obtusely convex; supra-orbital margin rather sharply reflexed; surface rather strongly impressed within the sides and carinæ, less so along the obsolete frontal suture. Antennæ slender and long, attaining the pronotal base; joints 3-8 elongate, eighth less so, ninth and tenth triangular, ninth scarcely as wide as long, tenth scarcely as long as wide, eleventh oval and evenly rounded at tip, ninth to eleventh moderately compressed. Eyes not prominent.

Pronotum about a fourth wider than long, evenly and moderately convex; apex feebly and broadly emarginate in almost circular arc; apical angles obtusely rounded and not prominent; sides moderately arcuate in middle three-fourths, thence sinuate to the angles, more broadly so posteriorly than anteriorly, margin sharp and slightly reflexed, especially posteriorly; base broadly and very moderately arcuate in middle three-fifths, thence sinuate to the angles, the latter acute and slightly prominent from the lateral and basal sinuations; disk coarsely and quite evenly punctate; punctures discrete; surface impressed along the sides and within the basal angles.

Elytra oval, about a half longer than wide; base feebly emarginate; humeri obtuse, scarcely distinct; sides broadly and rather strongly arcuate; apex rather narrowly rounded; disk rather evenly convex although slightly depressed on dorsum, with moderately impressed striæ of coarse, closely placed punctures; intervals convex, feebly so on dorsum near the suture, strongly so laterally and on apical declivity, becoming quite costulate, with extremely minute and very widely spaced punctules, each with a very minute hair; sutural interval flat to apex.

Beneath coarsely punctate; punctures on abdomen slightly less coarse and a little more sparse, denser on fifth segment. Legs moderate in length and slenderness, rather strongly sculptured.

Length (types), 7-7.5 mm.; width 3-3.5 mm.

Ildefonso Island, seventeen specimens.

Type: Female, No. 1145, and *allotype*, male, No. 1146, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, May 17, 1921, on Ildefonso Island, Gulf of California. Paratypes in the Academy collection and in that of the author.

Cribrata is recognized by the coarsely punctate elytra, impressed striæ and quite costulate elytral intervals. The sides of the pronotal disk are sinuate at the angles. The following synoptic table will aid in placing the species:

Lateral pronotal margin acute; not thickened; disk densely punctate; male without a pubescent fovea on first abdominal segment	1
Lateral pronotal margin distinctly thickened and obtuse; disk rather sparsely punctate; male with a pubescent fovea on first segment.....	<i>sparsa</i> n. sp.
1. Surface of body without raised microscopical granules.....	2
Surface of body with raised granules; apical angles of pronotum acute and anteriorly prominent; punctuation of elytra not distinct.....	<i>granulata</i> n. sp.
2. Elytra with impressed striæ of coarse punctures; intervals rather distinctly costulate laterally and apically; pronotal punctures discrete.....	<i>cribrata</i> n. sp.
Elytra with striæ of smaller punctures; intervals at sides and apex feebly subcostulate; pronotal punctures at sides more or less coalescent.....	<i>puncticollis</i> Horn

The surface luster is dull in *granulata* and *cribrata*; rather dull but feebly shining in *puncticollis* and polished and shining in *sparsa*. At first sight there is marked resemblance between *Orthostibia frontalis*, *Stibia puncticollis*, *granulata* and *cribrata*. *Orthostibia* is recognized by the form of the epistoma which is not deflexed.

EDROTINI

43. *Edrotes mexicanus* Blaisdell, new species

Form oval; quite resembling *Amphicyrta dentipes* Esch. Color black, legs slightly piceous; surface polished and shining beneath the indument. Pubescence long and quite sparse; each puncture with a hair.

Head coarsely and very sparsely punctate; supra-antennal convexities closely and coarsely punctate. Epistoma slightly arcuate at apex, angles distinct and narrowly rounded; transverse, sides rather deeply sinuate to receive the somewhat swollen base of the mandibles; surface with transverse rugæ, sparsely punctate; punctures large and small.

Pronotum sparsely punctate; punctures moderately small in the central three-fifths; laterally very coarsely punctate, punctures deeply impressed, intervals narrow and prominent; apical angles subacute.

Elytra rounded oval, scarcely longer than wide, strongly and arcuately declivous posteriorly; very sparsely and finely punctate; each puncture with a small rounded granule at its anterior border; hairs yellowish gray; inflexed sides with sparse, coarse and impressed punctures, each with an attending granule.

Propleura with very coarse punctures similar to those on sides of pronotal disk. Mesosternal episternum with very large, shallow punctures; epimera impunctate. Metasternal episterna very coarsely punctate, punctures more or less open posteriorly. Epipleura arcuately terminating opposite the middle of the metasternum; surface with distinct and slightly confused double row of coarse punctures. Legs moderate in length.

Length (types), 7-9 mm.; width 4.5-5.9 mm.

Guaymas, April 7 and 13; San Marcos Island, May 12; San Pedro Bay, July 7; Tepoca Bay, April 25; 23 specimens taken.

Type: Female, No. 1147, and *allotype*, male, No. 1148, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 7, 1921, at **Guaymas, Sonora, Mexico**.

The elytral pubescence is not lineate when viewed from behind.

44. *Edrotes asperatus* Blaisdell, new species

Form more robust, ovate. Color black; legs slightly piceous. Surface polished and shining beneath the indument. Pubescence long, abundant, nearly ashy in color.

Head very sparsely punctate; punctures small and equal; supra-antennal convexities not strongly punctate; punctures moderate and not strongly impressed. Epistoma arcuate at apex; angles narrowly rounded; sides broadly sinuated, about as long as wide; surface sparsely punctate and broadly tumid at base.

Pronotum finely and very sparsely punctate in the central three-fifths, in lateral fifths the punctures coarse and not strongly impressed; intervals not prominent; apical angles acute.

Elytra broadly oval, slightly inflated; arcuately and very strongly declivous posteriorly, very sparsely punctate; punctures very small, with a more or less noticeable granule anteriorly; inflexed sides very sparsely punctate; punctures slightly coarser than on the disk and moderately impressed.

Propleura moderately coarsely and very sparsely punctate; punctures rather larger than on the lateral fifth of pronotal disk. Prosternal process and mesosternum very coarsely rugoso-punctate and on the same plane. Mesosternal episterna very coarsely punctate; punctures rather impressed and open posteriorly; epimera impunctate, rather feebly asperulate. Metasternal episterna very coarsely punctate. Epipleura with two slightly confused rows of moderate punctures; terminating anteriorly opposite the anterior border of the metacoxæ. Abdomen very sparsely punctate; punctures rather small, more abundant on fourth and fifth segments.

Length (types), 10-12 mm.; width 5.5-6.5 mm.

Angeles Bay, three specimens.

Holotype, female, No. 1149, and *allotype*, male No. 1150 Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 7, 1921, at **Angeles Bay, Lower California**. Paratype in author's collection.

The species of *Edrotes* are robust convex insects, invested with conspicuous erect and long hairs; the pronotal apical angles are sharp, long, and therefore prominent anteriorly. There are more species than have been recognized and Casey was the first to determine this fact. These insects are covered with an exudate to which dirt adheres and which disguises the sculpturing, and the very good differential characters are not observed. They must be carefully cleaned with chloroform applied with a soft camel-hair brush.

CRANIOTINI

45. *Craniotus pubescens* Lec.

Two specimens of this very interesting species were taken on Isla Partida, April 22. It was known heretofore, only from the Maricopa desert of Arizona. A definite record is

La Puerta, Imperial Co., California, November 12. The finding of this species south of the Mexican boundary extends its range of distribution materially and may lead to a better knowledge of its lines of affinity. It is not as rare as it is believed to be. I have a series of five specimens in my own collection.

This genus is easily recognized "from all others of the tribe by the very prominent triangular lateral lobes of the head." (Horn).

ZOPHERINI

46. *Zopherodes tristis* LeConte

A single specimen was taken at Loreto, May 20. The species had previously been reported from the same region by Dr. Geo. Horn, in "The Coleoptera of Baja California". (Proc. Calif. Acad. Sci., Series 3, Vol. IV, p. 397, 1894.)

ANEPSIINI

47. *Anepsius confluens* Blaisdell, new species

Form oblong-oval, convex; width of pronotum and elytra quite equal; about two and a half times longer than wide. Color nigro-piceous to black; beneath piceo-rufous; antennæ and border of head ferruginous; lustre dull.

Head trapezoidal, not coarsely but rather closely punctate; punctures slightly denser laterally with a tendency to form a short carinule along side of each puncture; vertex slightly impressed, with punctures more widely spaced. Eyes completely divided; lobes elongate and parallel. Antennæ moderate in length and stoutness; joints nine and ten triangular, equal and as long as wide.

Pronotum about a third wider than long; evenly and moderately convex; apex subtruncate; sides broadly and evenly rounded, slightly more converging posteriorly; apical angles obtusely rounded; base scarcely truncate; basal angles small, rectangular, and rather acutely prominent; punctures of disk small, perforate and rather widely separated in central area; laterally slightly larger, more oval and longitudinally confluent; intervals rugiform and rather longitudinal.

Elytra less than twice as long as wide, oblong-oval, obtusely rounded at apex; sides distinctly and evenly arcuate; humeri obtusely rounded; disk evenly convex; punctures small, slightly quadrate, in close-set even series throughout, the alternate series toward sides developing carinules which become obsolete toward the suture.

Propleura finely rugulose. Abdomen shining and rather coarsely but somewhat sparsely punctate.

Length (type), 3.9 mm.; width 1.4 mm.

Isla Partida, April 22; Isla Raza, April 21; Mejia Island, April 20; Pond Island Bay, Angel de la Guardia Island, July 1; six samples studied, one, a paratype, was pale from immaturity.

Type: Sex undetermined, No. 1151, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 22, 1921, at **Isla Partida, Gulf of California.**

Confluens is very distinct in its acute basal pronotal angles from any congeneric species described from the United States. The genus is not mentioned in the *Biologia*.

48. *Anepsius angulatus* Blaisdell, new species

Similar in form to *confluens* but somewhat smaller and duller in lustre. Punctuation more shallow and not perforate.

Head quite evenly and closely punctured; slightly asperate, with very sparsely placed tuberculiform granules on the epistoma. Eyes completely divided.

Pronotum as in *confluens*. Punctures more evenly and closely placed in the central area, scarcely coalescent and with rather plicato-reticulate intervals; basal angles as in *confluens*.

Elytra with close-set series of very shallow punctures which become indistinct laterally between the linear carinules; each puncture with an appressed seta.

Under surface as in *confluens*.

Length (type), 3.5 mm.; width 1 mm.

Type: Sex undetermined, No. 1152, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, May 20, 1921, at **Loreto, Lower California.**

The single specimen taken differs from *confluens* in its sculpturing as given above. Both species agree in the shape of the basal angles of the pronotum and with certain species from the United States, in having the eyes completely divided. In all species from north of the Mexican boundary the basal angles of the pronotum are rounded. The eyes are divided by the prominent sides of the head into two elongate and equal parts, the upper is limited above by a projecting supraorbital ridge, the lower by the likewise prominent upper part of the gena.

CRYPTOGLOSSINI

49. *Centrioptera spiculifera* LeConte

This, the largest species of the genus, is quickly recognized by the well developed spiculæ at the sides and apical declivity of the elytra. The thorax is more or less obsoletely punctulate and smooth, the mentum coarsely punctured and convex at middle, mesosternum only slightly declivous as compared to the horizontal prosternal process; abdomen very sparsely and irregularly punctate, punctures very moderate in size and most abundant on fifth segment.

One specimen of this species was secured on Monserrate Island, June 13, and another was taken by J. C. Chamberlin on Espiritu Santo Island, May 31. It has previously been reported from San José del Cabo. A considerable series from Santa Rosa, Lower California, is before me. Both sexes are present in this material and show that the species is distinctly stouter and broader than *pectoralis* Blaisdell.

50. *Centrioptera pectoralis* Blaisdell

Recently described from specimens taken on San Benito Island off the west coast of Lower California. A series of six specimens, taken by Mr. Van Duzee and Mr. Chamberlin, appear identical with the type specimens. They were collected on the main land of Lower California at Loreto, May 20; Angeles Bay, May 5 and 7; Escondido Bay, May 24, and at Puerto Ballandra, Carmen Island, May 21. These localities occur between lat. 26 and 28, on the main land and on islands off both the western and eastern coasts. It evidently is a widely distributed species, differing from *spiculifera* in its elongate oblong form, smaller elytral spiculæ, more strongly declivous mesosternum and more abundant punctuation of the ventral surface.

51. *Centrioptera dulzuræ* Blaisdell

A single specimen of this common, although rarely collected species of southern California was taken at Angeles Bay, May 5. *Dulzuræ* is smaller in size than either *spiculifera* or *pectoralis*; the elytral spiculæ are rather less de-

veloped than in the latter species. In *pectoralis* the head is broader and the epistoma more broadly arcuate and more coarsely punctured. In all three species the punctuation of the under surface differs only in detail. *Dulzura* cannot be confused with the larger and more robust *spiculifera*. It is more closely allied with *pectoralis* and *chamberlini* (vidi infra).

52. *Centrioptera chamberlini* Blaisdell, new species

Form elongate-oblong. Color deep black, more or less shining.

Head rather broadly impressed between the anterior border of the eyes; epistomal surface distinctly and the front moderately convex; fronto-epistomal border rather broadly arcuate but noticeably slightly oblique and convergent at the sides in front of the eyes; central area with a few scattered punctures which become denser along the fronto-epistomal margin. Antennæ extending to the pronotal base. Mentum cordate, about as long as wide, coarsely punctate, feebly convex and obliquely impressed along the sides.

Pronotum a little wider than long; apex truncate between the oblique inner margin of the apical angles; the latter acute, anteriorly prominent and moderate in width; base truncate, equal to apex; sides broadly and evenly rounded, posteriorly convergent and rather feebly sinuate, becoming parallel for a short distance before the angles which are rectangular; disk moderately convex, slightly declivous antero-laterally, extremely sparsely and finely punctulate, glabrous and alutaceous.

Elytra oblong, about twice as long as wide; base truncate and equal to pronotal base; humeri obtuse, angle distinct; sides very feebly divergent posteriorly and feebly arcuate, more strongly rounded in apical third, apex broadly rounded; disk moderately flattened on dorsum and slightly convex, more strongly rounded at sides, rather abruptly and obliquely declivous at apex; punctures arranged in series centrally and simple, those of the intervals gradually developing into short spiculæ at sides and on apical declivity, spiculæ obsolete on sutural interval.

Propleura obsoletely sculptured. Prosternal process strongly impressed along middle, rather coarsely rugoso-punctate. Prosternum anterior to coxæ obsoletely rugoso-punctate. Mesosternum quite horizontal, vertical and rather prominent anteriorly and impressed at middle and strongly but not very densely punctate; bi-impressed posteriorly and impunctate. Parapleura very sparsely punctate; metasternum with a few scattered punctures and rugæ. Abdomen with few scattered punctures along middle third, a slightly increased number at sides, denser behind coxæ; third segment nearly impunctate, fifth sparsely and strongly punctate. Legs rather long and moderately stout.

Male: Abdomen slightly oblique to sterna and feebly flattened along middle third.

Female: Abdomen moderately convex, horizontal, very feebly flattened.

Length (types), 22-25 mm.; width 8.5 mm.

Sal si Puedes Island, May 9, J. C. Chamberlin, five specimens; San Lorenzo Island, May 9, J. C. Chamberlin, one specimen. The smaller specimen referred to this species, a male, has the mentum distinctly oval, slightly longer than wide. Large series are necessary for working out the relationships of the different phases.

Type: Female, No. 1153, and *allotype*, male, No. 1154, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, May 9, 1921, on Sal si Puedes Island, Gulf of California. Paratypes in collection of the Academy and in that of the author.

53. *Centrioptera seriata* LeConte

This species is easily recognized by the form of the prosteral process which is truncate and not extended behind the coxæ; sides and apical declivity of elytra scarcely spiculiferous. Three specimens were collected on Ceralbo Island, June 7, by Mr. Chamberlin and Mr. Van Duzee. Common on the mainland of Lower California. Specimens are before me that were collected at Santa Rosa and San Pedro, Lower California. Horn states that it is found in Arizona, Nevada and southern California besides San José del Cabo.

54. *Centrioptera sculptiventris* Blaisdell, new species

Form oblong-oval, subparallel. Color black, more or less dull throughout.

Head relatively large; fronto-epistomal border quite evenly arcuate from eye to eye, rather broadly impressed along the frontal suture; epistoma convexly prominent along median line, causing the frontal impression to appear deeper each side; front evenly and not strongly convex, obsoletely punctate, punctures quite strong on the epistoma and sides of the front before the eyes, sparse centrally. Antennæ moderate in length and stoutness, not incrassate.

Pronotum about a fourth wider than long; apex truncate between the oblique inner margins of the prominent and acute angles; base truncate, scarcely as wide as apex; sides broadly arcuate in anterior five-sixths, widest just in front of the middle, less arcuate posteriorly, broadly sinuate before the base where the sides become parallel for a short distance; basal angles rather sharply rectangular; disk moderately convex, rather strongly declivous at apical angles, to inner side of which is a feeble marginal impression, obsoletely and very finely punctate in a

broad central area, punctures becoming more distinct near the sides which are narrowly impressed along the margin, the impressed area punctato-rugose.

Elytra oblong, scarcely twice as long as wide, rather flat on dorsum; base truncate, equal to pronotal base; humeri obtuse, not in the least prominent; sides parallel, slightly and broadly arcuate, somewhat oblique in apical fourth, apex moderately broadly rounded; disk rather obliquely declivous in apical fourth, feebly convex on dorsum, rather broadly and evenly rounded at sides; striæ of punctures evident and simple in sutural areas, the interstitial series becoming gradually converted into short spiculæ at sides and on the apical declivity; sutural interval smooth throughout.

Propleura sparsely and rather coarsely punctured, sculpturing somewhat eroded. Prosternum not densely punctato-rugose, process flat, feebly impressed along middle. Parapleura and abdomen quite strongly and not very sparsely punctate. Mesosternum feebly declivous; vertical and rather prominent anteriorly, feebly impressed at middle of apex, angles slightly tuberculiform; surface rather closely punctate with an impunctate area posteriorly. Abdomen nearly evenly punctate on all segments; horizontal, rather flattened along middle third. Legs rather moderate in length and stoutness, rather densely sculptured.

Length (types), 22-24 mm.; width 8.5-8.8 mm.

San Pedro Bay, July 7, two specimens; Willard's Point Bay, Tiburon Island, July 3, J. C. Chamberlin; Isla Partida, May 3, Virgil Owen.

Type: Female, No. 1155, and *allotype*, male, No. 1156, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, July 7, at San Pedro Bay, Sonora, Mexico. One paratype in collection of the Academy and one in that of the author.

The four specimens studied agree in all particulars. Readily recognized by the strongly sculptured under surface. The intercoxal process of the first abdominal segment is coarsely rugose. The mentum is cordate and distinctly carinate at middle.

55. *Centrioptera asperata* Horn

A considerable series was taken at the following localities: Espiritu Santo Island, May 3; Loreto, May 20; Puerto Ballandra, Carmen Island, May 31; Ceralbo Island, June 7; San Diego Island, June 11. Typical *asperata* should have the mesosternum and metasternum on exactly the same plane, the elytra oval, flattened on the disk and ornamented with series of elevated tubercles, more or less acute on the disk, becoming acute but scarcely asperate posteriorly. I consider

that in typical specimens the bases of the tubercles become more or less continuous across the intervals. There are variations both as regards the tubercles and the mesosternal plane. A specimen is before me collected at La Paz. The type was taken by Mr. Gabb without definite locality. Horn names Cabo San Lucas in his "Coleoptera of Baja California".

56. *Centrioptera asperata discreta* Blaisdell, new variety

A good representation of this race was taken at the following places: Puerto Ballandra, Carmen Island, May 21; Coronados Island, May 18; San Diego Island, May 27; San José Island, May 23; San Francisco Island, May 30; Espiritu Santo Island, May 31 and Salinas Bay, Carmen Island, June 16.

Discreta has the form and general sculpturing of *asperata* only the tubercles are discrete, well defined, and in the intervals is a row of very widely spaced granules, more or less shining at tip; these may be very small or even tuberculiform. The sutural interval and an apical area are without tubercles as in *asperata*. The sides of the abdominal segments are apparently more densely punctured.

In both *asperata* and *discreta* the male has the first two abdominal segments moderately well impressed in the middle third, the impression broadly and indefinitely oval.

Length (types), 19-21 mm.; width 8-9.5 mm.

Type: Female, No. 1157, and *allotype*, male, No. 1158, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 16, 1921, at Salinas Bay, Carmen Island, Gulf of California. Paratypes in Academy collection and in that of the author.

57. *Centrioptera asperata subornata* Blaisdell, new variety

A moderate series of this race of *asperata* was taken by the expedition at the following points: Cerralbo Island, June 7; Santa Catalina Island, June 12; Monserrate Island, June 13; and at Escondido Bay, June 14.

The specimens agree in being slightly more elongate than typical *asperata*, in having the sculpturing much less developed, approaching *seriata* in this respect. In a broad discal area of the elytra the tubercles are obsolete and replaced by mod-

erately coarse punctures in rows, with an interstitial series of widely spaced similar punctures; at the sides the tubercles are more or less feebly developed and show a tendency of their bases to coalesce across the intervals.

Asperata and its races are similarly punctured beneath; propleura opaque, very sparsely and rather obsoletely punctured; punctures of the parasternal pieces smaller than on the mesosternum, metasternum and abdomen.

Length (types), 20-22.5 mm.; width 9-10 mm.

West Galleras Island near Monserrate Island, June 13. J. C. Chamberlin.

Type: Female, No. 1159, and *allotype*, male, No. 1160, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, June 13, 1921, on West Galleras Island, Gulf of California. Paratypes in Academy collection and in that of the author.

58. *Centrioptera asperata planata* Blaisdell, new variety

This race seems to be peculiar to Ildefonso Island where a moderately good series was taken by Mr. Virgil Owen and Mr. J. C. Chamberlin on May 17.

Planata differs from the previously defined races of *asperata* by its more elongate form. The sculpturing is less strong than in *discreta*. In typical *asperata* and in *discreta* the form is more robust and therefore less elongate and relatively broader. *Planata* is more distinctly sculptured than is *subornata*. Details of the variation in sculpturing cannot be stated for the ultimate description must come from large series of the various forms from all localities.

Length (types), 21 mm.; width 9 mm. The largest female measured 23 mm. in length and 9 mm. in width.

Type: Female, No. 1161, and *allotype*, male, No. 1162, Mus. Calif. Acad. Sci., collected by Virgil Owen, May 17, 1921, on Ildefonso Island, Gulf of California. Paratypes in collection of the Academy and in that of the author.

59. *Centrioptera variolosa* Horn

This species occurs abundantly in Arizona, the type having been taken at Fort Grant. Horn states that it occurs also at San Francisquito, Lower California. A very large series was

taken by the expedition, mostly under stones, at the following localities: Guaymas, April 11; Patos Island, April 23; south end of Tiburon Island, July 4; San Pedro Bay, July 7, and San Carlos Bay, July 8.

In *variolosa* the head and pronotum are very coarsely punctured. The mesosternum and metasternum are as in *asperata*. The elytra are sculptured with regular series of elevated smooth tubercles, becoming acute at sides and apex but not spiculiferous; the sutural intervals and apical area are feebly sculptured.

The number of species and the large series taken by the expedition warrant a synoptical statement of diagnostic characters at this time:

SYNOPTIC TABLE OF THE SPECIES OF CENTRIOPTERA MANN.

Elytra striato-punctate, not at all spiculiferous; prosternum produced behind the coxæ; hind thighs distinctly granulate within; thorax wider than long.....	<i>infausta</i> Lec.	
Elytra with series of more or less evident tubercles, becoming spiculate at sides and on apical declivity; hind thighs more or less denticulate or granulate within.....		1
1. Prosternum not produced behind the coxæ but truncate; elytra scarcely spiculiferous.....	<i>seriata</i> Lec.	
Prosternum produced behind the coxæ.....		2
2. Basal angles of pronotum distinctly everted, the lateral margin in front of them slightly reflexed; form more robust than usual.....	<i>angularis</i> Horn	
Basal angles not everted nor the margin reflexed.....		3
3. Head and pronotal disk very coarsely punctured; elytra with regular series of elevated smooth tubercles, slightly acute posteriorly but not spiculate.....	<i>variolosa</i> Horn	
Head and pronotum smooth with or without fine punctules in the central area and a few coarser punctures at the periphery or sides.....		4
4. Mesosternum and metasternum on exactly the same horizontal plane.....		5
Mesosternum and metasternum not on the same plane, the former more or less anteriorly declivous.....		6
5. Abdomen glabrous with a few widely scattered very small punctures; fifth ventral coarsely punctate; mentum coarsely punctate, subcarinate at middle and obliquely impressed laterally; form elongate.....	<i>chamberlini</i> n. sp.	
Abdomen sparsely and irregularly punctate; punctures rather coarse and of the same size throughout; mentum evenly convex and coarsely punctate.....	<i>asperata</i> Horn	
(a) Elytral tubercles coalescing at base across the intervals; form more robust.....	Var. <i>asperata</i> Horn	

- (b) Elytral tubercles discrete, distinctly separated; intervals with a series of small widely spaced granules; form similar.....Var. *discreta* n. var.
- (c) Elytra less strongly sculptured; central area serially punctate; tubercles not strongly developed.....Var. *subornata* n. var.
- (d) Elytra more strongly sculptured; tubercles discrete or coalescing at base across the intervals; form more elongate. Ildefonso Island.....Var. *planata* n. var.
6. Mesosternum strongly declivous; head coarsely and densely punctate; form more robust.....*texana* n. sp. 7
Mesosternum only slightly anteriorly declivous.....
7. Elytra with strongly developed spiculæ at sides and on apical declivity; largest and most robust species.....*spiculifera* Lec. 8
Elytra with moderately developed spiculæ; more elongate species
8. Abdomen strongly and densely punctate at sides; mentum distinctly carinate and nearly smooth anteriorly..... 9
Abdomen less strongly and rather sparsely punctate at sides.... 10
9. More densely and coarsely sculptured beneath, opaque.....*sculptiventris* n. sp. 11
Less densely and less coarsely punctured beneath; more shining.....*muricata* Lec.
10. Pronotal lateral submarginal area obsolete punctate..... 11
Pronotal submarginal area more coarsely and distinctly punctate; discal convexity continuous even to marginal bead on each side; surface strongly shining and glabrous.....*utensis* Casey
11. Surface dull and alutaceous; abdomen with very few scattered small punctures, with a group of coarse punctures behind the metacoxæ and on fifth ventral segment; mentum less strongly and more sparsely punctate and obliquely impressed laterally.....*dulzura* Blais.
Surface less dull and somewhat shining; abdominal punctures coarser and equal in size throughout and more abundant; mentum very coarsely and closely punctate.....*pectoralis* Blais.

Infauستا and *utensis* are the only two species not at hand. The interpolation of *utensis* into the above table has been purely guess work for no tangible and important character could be obtained from the original description.

60. *Cryptoglossa granulifera* Champion

Three specimens of a *Cryptoglossa* were taken by the expedition which are somewhat doubtfully referred to the above species. Two of these were taken on Isla Partida, June 26 and May 3 by Virgil Owen, the other on Mejia Island, May 3, by J. C. Chamberlin. These specimens answer so closely

to Champion's description of *granulifera* that I consider it unwise to separate them as a new species. Specimens of *granulifera* are not available and Champion's description is so poor in essential characters that it is best, for the present at least, to wait until material from the type locality can be obtained. It is an interesting species and in form resembles *Centrioptera angulata* Horn, but the eleventh antennal joint is short and transverse and the pronotal apex much less emarginate than in *angulata*.

ASIDINI

61. *Asida* (*Heterasida*) *connivens* LeConte

A single female of this species was obtained on Ceralbo Island, June 7, by Mr. J. C. Chamberlin. I have three specimens in my own collection for comparison. They were collected at San José del Cabo and represent both sexes. Two specimens of *Asida bifurca* Lec. show beyond all dispute that *connivens* is a distinct species and contradicts Horn's view that the latter is the male of the former. In *connivens* the basal angles of the pronotum are acute and divergent; the elytra have a sharp lateral margin inside of which is an acute costa which meets the acute margin at the humeri, and converge posteriorly to terminate near the suture about one third from apex; the marginal costa extends to within one-sixth of the apex.

62. *Asida* (*Asidina*) *paralela* LeConte

Three specimens taken on Isla Partida, April 22, cannot be separated from this species. They are distinctly larger and broader than specimens I have seen from the Colorado Desert but otherwise quite identical. Color brown; elytral margin acute, nearly reaching the apex; another short costa parallel with the margin and a short distance from it, extends through the middle two-thirds of the length of the elytra. Pronotal margin narrowly explanate and slightly reflexed. Length 17 mm., width 7.5 mm.

63. *Asida (Asidina) parallela terricola* Blaisdell, new variety

Form similar to *parallela* Lec., very slightly widest behind the middle, feebly inflated. Color dark brown. Punctures bearing minute setæ.

Head finely, not closely and subsparately punctate; front scarcely convex, impressed along the frontal suture; epistoma slightly convex, broadly sinuate at apex; sides of front before the eyes arcuately prominent, surface convex, border emarginate at the oblique sutures. Antennæ slender.

Pronotum quadrate; disk evenly and scarcely moderately convex, shining, finely and sparsely punctate; sides moderately and evenly arcuate, distinctly reflexed and asperate within; apex rather deeply and evenly emarginate; apical angles acute and anteriorly prominent; basal angles subacute and slightly prominent posteriorly; base scarcely arcuate and very slightly sinuate at the reflexed margin.

Elytra oval, parallel; sides slightly and evenly arcuate, rather obliquely so posteriorly; apex not broadly rounded; disk a little convex, arcuately declivous posteriorly; humeri obtuse, elytral base equal to the pronotal base; margin acute, feeble, terminating about an equal distance from both suture and apex; another short costa parallel and within the margin and a short distance from it, extending through the middle two-fourths of the length of the elytra; other lines are obsoletely indicated; surface finely asperate.

Under surface very finely and not closely punctured, finely asperate. Legs slender.

Length (type), 12.5 mm.; width 6 mm. Guaymas, one specimen.

Type: Female, No. 1163, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 10, 1921, at **Guaymas, Sonora, Mexico**.

Evidently related to *parallela* Lec. The single typical specimen is a female but it seems to be sufficiently distinct in its more slender legs, more convex body, and feeble elytral costæ, with other lines obsoletely indicated on each elytron, and the shining pronotal disk, to warrant placing it as a race. Both *parallela* and *terricola* are clothed with very short yellowish hairs or setæ. The antennæ are missing in the type, only a part of one remaining. A second female specimen collected on Santa Inez Island, May 13, is in all probability of the same species but showing some divergence. The pubescence is longer and the reflexed margin of the pronotum is feeble as are also the elytral costæ, the inner one of which is

obsolete. The divergence shown in this specimen leads away from *parallela* and strengthens the status of *terricola*.

64. *Asida (Asidopsis) divaricata* Blaisdell, new species

Form elongate, narrowed anteriorly, widest just behind the middle of the elytra. Color deep black, glabrous and shining.

Head short, punctures small and well separated, feebly impressed along the sutures; sides of front arcuate, not prominent, border emarginate at the oblique suture; sides of epistoma convergent, apex broadly and feebly sinuate. Antennæ short; eleventh joint rufous; outer three compressed.

Pronotum distinctly longer than wide; apex broadly and moderately deeply emarginate; apical angles acute and anteriorly prominent; sides broadly and not strongly arcuate, becoming rather deeply sinuate before the large divergent basal angles; margin thickened and crenato-rugose; base scarcely arcuate, wider than apex; basal angles subacute and markedly divaricate and prominent posteriorly; smooth; disk impunctate, moderately convex, somewhat declivous posteriorly, flattened within the apical angles.

Elytra elongate oval; base arcuate, oblique laterally to the obtuse humeri, adapted to the basal angles of the pronotum; sides moderately arcuate, rather oblique in posterior third and feebly sinuate before the apex, the latter rather broadly rounded; disk rather feebly convex on dorsum, gradually declivous at base, rather strongly rounded and inflexed at the sides, narrowly rounded and distinct at the humeri; arcuately declivous posteriorly; smooth and impunctate.

Abdomen impunctate, feebly rugose; propleura smooth, feebly rugose and obsoletely punctate anteriorly; sterna with a few small punctures; mesosternal episternum with a few rather coarse and distinct punctures. Legs long and very slender.

Length (type), 22.5 mm.; width 9.5 mm. Escondido Bay, one specimen.

Type: Sex unknown, No. 1164, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, June 14, 1921, at **Escondido Bay, Lower California**.

A unique and very distinct species related to *Asida macra* Horn. The polished black color, long prothorax with large basal divaricate angles, short antennæ and slender legs are very striking characters.

65. *Asida (Stethasida) granicollis* Blaisdell, new species

Form elongate oval. Color dull brownish black.

Head short and transverse, rather finely granulato-punctate, impressed on frontal suture; sides before eyes not prominent, feebly arcuate; emarginations feeble at the oblique sutures; epistoma broadly and feebly sinuate at apex. Antennæ short, moderately slender; eleventh joint pale.

Pronotum about a fourth wider than long; apex rather deeply and evenly emarginate; apical angles acute and anteriorly prominent; sides moderately arcuate, broadly sinuate in basal fourth, margin scarcely thickened or reflexed; basal angles subacute and slightly prominent posteriorly; base feebly and broadly arcuate, feebly sinuate within the angles; disk moderately convex centrally, somewhat impressed at the periphery, with discrete shining granules in central area and granulato-asperate at the periphery.

Elytra about four-sevenths longer than wide; base adapted to the pronotal base, slightly oblique at humeri, the latter obtuse; sides evenly and broadly arcuate to apex, the latter rather narrowly rounded; disk with a sharp and rather fine lateral margin which ends just before the apex; within this is a costa which joins the margin at about the junction of the basal and middle thirds, becoming parallel to the margin and terminating before the apex; a discal costa starting just behind the base and within the humeri passes backward, curving slightly toward the suture and before terminating runs parallel to the suture to top of the apical declivity; disk flat, obsolete very sparsely and extremely finely granulato-punctate within the costæ, between the costæ with widely separated small granules; more or less rugulose at apex.

Beneath finely and not very densely punctate. Legs of moderate length and of very moderate stoutness.

Length (type), 16 mm.; width 7 mm. Guaymas, one specimen.

Type: Sex unknown, No. 1165, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 14, 1921, at **Guaymas, Sonora, Mexico.**

Granicollis does not answer to any of the species described in the *Biologia* and is quite different from any form north of the Mexican Boundary.

66. *Asida (Stethasida) catalinæ* Blaisdell, new species

Form oblong-oval, a little more than twice as long as wide. Color piceous and opaque.

Head short and transverse before the post-ocular line, feebly impressed on frontal suture; epistoma short and feebly sinuate at apex; sides before the eyes slightly prominent and acute to the very feeble sinuation at the oblique suture. Antennæ missing.

Pronotum about as long as wide; apex deeply and evenly emarginate between the acute and anteriorly prominent apical angles; sides broadly arcuate; base rather broadly sinuate laterally to the obtuse and very slightly posteriorly prominent basal angles; disk broad, evenly and slightly convex, sides narrowly explanate and reflexed, granulato-asperate.

Elytra rather oblong, about four-sevenths longer than wide; base rather emarginate; humeri obtuse and not in the least prominent; sides slightly diverging, at first almost straight, thence becoming rather broadly arcuate in apical two-thirds, apex moderately narrowly rounded; disk flat, arcuately declivous posteriorly; lateral margin distinct, slightly raised and rather coarse, on apical declivity passing arcuately toward the apex which it does not quite attain; with a costa parallel with the margin and a short distance from it extending through the middle two-fourths; there are slight evidences of two other lines on each elytron; surface granulato-asperate, especially on the lines where the pubescence is rather more abundant, giving a slight subvittate appearance.

Under surface finely and rather thickly punctate, each puncture with a short yellowish hair. Legs moderate in stoutness, the anterior noticeably thicker. Described from the unique type.

Length (type), 17 mm.; width 7.4 mm.

Type: Sex unknown, No. 1166, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, June 12, 1921, on Catalina Island, Gulf of California.

In the feebly vittate lines on the elytra it might be suggestive of *Asida subvittata* Horn to which it bears no close relationship. In general facies it points to *Asida obsoleta* Lec., from which it differs in the oblong elytra with flat disk and vittæ. It also appears quite different from any species given in the Biologia.

SCAURINÆ

67. *Argoporis inconstans* Horn

This species is peculiar in having a truncate epistoma and the posterior femora armed with a long slender tooth one-third from apex. Color piceous black, feebly shining to rather dull; legs rufous. The striation of the elytra varies; in some specimens the intervals are convex and near the apex costiform. In the male the tubercle on the first abdominal segment is rounded and may be triplicate. A large series was secured from the following localities: Isla Partida, April 22, July 1, 2, May 3, in rotten stems of *Cereus pringleyi*; Sal si Puedes Island, May 9; Las Animas Bay, May 8; Isla Raza, April 21.

A single male from Carmen Island is decidedly more opaque with the stria punctures strong and the intervals costate at apex. It was taken May 21, at Puerto Ballandra.

Length of largest specimen, 16 mm.; width 5.5 mm.

68. *Argoporis alutacea* Casey

Originally described from Arizona. In the collection made by the expedition are two males referable to this species; they were taken at San Pedro Bay and San Carlos Bay, Sonora, July 7th and 9th, respectively. Color piceous black; legs dark rufous; metafemora of male with a large bifid tooth the edges of which are finely denticulate.

69. *Argoporis labialis* Blaisdell, new species

Form parallel, elongate, rather depressed. Color piceous black, darker above; legs rufous, tibiae slightly darker.

Head about as long as wide, very finely and evenly punctate; epistoma convex, slightly produced at middle of apex, feebly sinuate each side; front feebly convex, longitudinally impressed within the antennal convexities and feebly along the frontal suture; sides before the eyes convergent and slightly reflexed. Antennae moderately stout, slightly incrassate, joints 8 to 10 transverse.

Pronotum slightly longer than wide; apex truncate, a little narrower than the base, the latter broadly and feebly emarginate; apical angles very obtuse; basal angles obtuse and distinct; sides broadly arcuate, convergent posteriorly; disk extremely finely and obsoletely punctulate.

Elytra about twice as long as wide, at middle just slightly wider than pronotum; humeri dentiform, very small; sides feebly arcuate, apex obtusely and rather broadly rounded; disk feebly convex on the dorsum, strongly and not broadly convex at sides, with rows of unimpressed and moderately large perforate punctures, these separated by a space equal to one to three times their diameters; intervals slightly convex, feebly costiform at apex.

Abdomen rather evenly punctate; punctures small. Legs moderate.

Male: Metafemora rather arcuate, swollen in distal third, with a short, stout, obtuse tooth, followed by three denticles, one of which is approximate to the tooth. Tubercle on first abdominal segment rounded, flat and feeble, with a short transverse impressed line anteriorly. Described from the unique type.

Length (type), 7.1 mm.; width 3.5 mm.

Type: Male, No. 1167, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, July 9, 1921, at San Carlos Bay, Sonora, Mexico.

Labialis apparently is distinct by the slightly lobed and bisinuate apical margin of the epistoma and the character of the femoral tooth. Another specimen taken at the same time and place is referred to *alutacea* Casey on account of the arcuate epistomal apex, the distinctly bifid femoral tooth, the edges of which are finely denticulate, and the stronger and raised tubercle on the first ventral segment.

70. *Argoporis æqualis* Blaisdell, new species

Form elongate, subparallel, slightly depressed. Color piceous black, legs dark rufous; surface rather dull, pronotum and head shining.

Head about as long as wide; epistoma broadly and slightly convex, apex arcuate; frontal and oblique sutures distinct, with the surface slightly impressed along the same; sides before the eyes distinctly convergent and very feebly arcuate; surface finely punctate, punctures denser laterally. Antennæ moderately slender; outer joints not distinctly transverse.

Pronotum about as long as wide; apex feebly arcuato-truncate; apical angles obtuse; base truncate in middle two-thirds, feebly and briefly sinuate laterally; sides broadly arcuate in anterior two-thirds, thence convergent and very feebly and broadly sinuate to base; basal angles subacute and slightly prominent posteriorly; disk moderately convex, glabrous, very feebly and sparsely punctate centrally, punctures becoming stronger and denser laterally.

Elytra about twice as long as wide, rather depressed; humeri very small and dentiform; sides feebly arcuate, more strongly so toward apex, the latter rather moderately broadly rounded; disk with regular striæ of small distinct punctures; intervals flat, becoming somewhat convex about apex, extremely minutely punctulate.

Abdomen very finely and rather sparsely punctate, somewhat longitudinally rugulose on first two segments. Legs moderate in length and rather slender.

Male: Metafemora moderately tumid in distal third; tooth rather long, slender and cylindrical; adjacent edge of femora denticulate. Inner edge of protibiæ distinctly denticulate. Tubercle of first abdominal segment at middle, rounded and narrowly transversely impressed at middle.

Length (types), 7-6.7 mm.; width 3.6-3.7 mm. An imperfect female measures 8 mm. in length.

San Pedro Nolasco Island, April 17, three specimens found under stones.

Type: Male, No. 1168, and *allotype*, female, No. 1169, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 17, 1921,

at San Pedro Nolasco Island, Gulf of California. Paratype in Academy collection.

The slender antennæ and peculiar elongate cylindrical femoral tooth seem sufficient to characterize *αqualis* as a distinct species.

71. *Argoporis longipes* Blaisdell, new species

Form elongate oblong-oval, rather stout, about three times as long as wide. Color dull black; antennæ and legs dark rufous.

Head about as long as wide, sides arcuate; epistoma feebly convex, impunctate, lobed at middle of apex and sinuate laterally; lobe obtusely rounded at apex; sutures distinct; front rather coarsely, irregularly, punctate. Eyes narrow, deeply and arcuately emarginate anteriorly by sides of the front. Antennæ unusually long, extending beyond the pronotal base, feebly incrassate.

Pronotum about as long as wide, widest anteriorly; apex very feebly arcuate centrally, scarcely sinuate laterally; apical angles obtuse, sides broadly and moderately strongly arcuate in anterior half, less so posteriorly, and feebly broadly sinuate and convergent to the angles, marginal bead rather thin and feeble; base broadly and feebly emarginate, bead rather broad and flat; basal angles rather rectangular and slightly subacute; disk rather strongly convex, impunctate and alutaceous; with an impressed median line and a feebly transverse impression in middle third, one-fifth from base.

Elytra rather oblong-oval, a little less than twice as long as wide; base broadly arcuate and equal to the pronotal base; scutellum transversely arcuato-triangular posteriorly, impunctate; humeri distinctly dentiform and slightly divergent; sides broadly arcuate, broadly sinuate opposite to apical declivity, apex rather broadly rounded; disk moderately convex, slightly flattened on dorsum and gradually declivous posteriorly, with nine rows of coarse perforate punctures on each elytron, punctures separated by a distance equal to one to three times their own diameter; intervals strongly convex, subcostiform, the sutural tumid at apex and ending abruptly before the apex; lateral three intervals flat near apex, seventh costiform to near the sutural.

Beneath nearly impunctate, dull in luster and alutaceous. Mesosternal episternum coarsely and densely punctate. Prosternal process compressed and cariniform at tip. Legs long; anterior longer than posterior; outer angle of protibiæ not produced.

Length (types), 17.5 mm.; width 5 mm. Escondido Bay, Lower California, June 14, two specimens.

Type: Sex not determined, No. 1170, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 14, 1921, at Escondido Bay, Lower California.

A paratype is smaller and has the anterior legs shorter. Whether or not these two specimens are the two sexes remains to be discovered as there are no tangible secondary sexual characters. Both antennæ are missing on the smaller specimen. *Longipes* is wonderfully distinct from anything heretofore described and a larger series may show the necessity of creating a new genus for its reception.

72. *Cerenopus concolor* LeConte

A very large series of this common species was taken at the following localities: Monserrate Island, May 24, June 23; Puerto Ballandra, Carmen Island, May 21 and 22; Loreto, May 19 and 20; San Francisco Island, May 30. The metafemora in the male are denticulate, one tooth slightly longer than the others, and the epistoma is prolonged and excavated beneath.

73. *Cerenopus cribratus* LeConte

A small series of specimens are referred to this species with some misgivings; they were collected by J. C. Chamberlin at the following places: Espiritu Santo Island, June 9; Agua Verde, May 26. In typical *cribratus* near the apex of the elytra the interspaces between the second and third and between the sixth and seventh rows of punctures are elevated and confluent, and form on each elytron a very prominent tubercle. These tubercles are not developed in the present specimens. The metafemora of the male are armed with a long acute tooth.

ELEODINI

74. *Eleodes inflata* Blaisdell, new species

Form robust, moderately inflated. Color deep black, more or less polished and shining.

Head feebly convex, sparsely and rather finely punctate.

Pronotum subquadrate, wider at anterior third, about a fourth wider than long; apex feebly sinuate between the moderately small, acute, anteriorly prominent angles; sides feebly arcuate, most so anteriorly, slightly converging posteriorly; base broadly and feebly arcuate; basal

angles obtuse, not in the least rounded; disk evenly and rather less than moderately convex, very sparsely and finely punctate.

Elytra more or less inflated in both sexes, base feebly emarginate, equal in width to pronotal base; humeri obtuse and distinct, not in the least prominent; sides more or less broadly arcuate; apex slightly produced and obtuse, slightly emarginate at the suture; disk strongly convex from side to side, feebly depressed on dorsum, distinctly striato-punctate, striæ not impressed, punctures small and rather closely placed in the series; intervals flat and extremely finely punctulate; punctures rather stronger and intervals feebly convex at sides and on apical declivity.

Prosternal process strongly punctato-rugose. Abdomen finely and very sparsely punctate. Legs moderately long; femora rather slender and not compressed.

Male: Rather less robust; abdomen feebly impressed along the middle.

Female: More robust; abdomen rather strongly and evenly convex.

Length (types), 21-25 mm.; width 7-10 mm.

Monserate Island, May 25, seven specimens.

Type: Female, No. 1171, and *allotype*, male, No. 1172, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 25, 1921, at **Monserate Island, Gulf of California**. Paratypes in Academy collection and in that of the author.

In the Revision of the Eleodiini (Bull. 63, U. S. Nat. Mus.), *inflata* was considered a form of *luca*, the latter a subspecies of *eschsoltzi* Sol. This tentative decision was based on a very small number of specimens. Later studies on a larger number of specimens indicate conclusively that *inflata* is a distinct species related to *ventricosa* Lec., and forms an annectant group between the *eschsoltzi* and *ventricosa* constituents. At the time the monograph was written only females had been seen, since then both sexes have been examined. The males show no evidence of developing a cauda. The specimens taken by the expedition consist of five individuals from Monserate Island, on the peninsular side of the Gulf, and two from the Sonoran side at San Pedro Bay. These latter are rather larger and duller in luster. The first specimens studied were from the region of San José del Cabo. For further remarks see Bulletin 63, page 292.

75. *Eleodes lorentensis* Blaisdell, new species

Form elongate oblong-oval, moderately stout. Color dull black, legs and under surface piceous; luster dull and rather alutaceous.

Head relatively small, feebly convex, finely and sparsely punctate. Antennæ moderate in length, not in the least incrassate; joints subequal in length.

Pronotum subquadrate, widest at middle, about a sixth wider than long; apex moderately sinuate, transverse centrally and oblique within the angles; the latter dentiform, moderately large, subacute and more or less divergent; sides broadly and rather strongly arcuate, slightly sinuate just behind the apical angles; base broadly arcuate, basal angles obtuse and not in the least rounded; disk moderately and evenly convex, rather declivous antero-laterally, finely and very sparsely punctate, punctures very small.

Elytra oblong-oval, moderately strongly convex from side to side, although more or less depressed on dorsum; base feebly emarginate, equal and adapted to the pronotal base; humeri obtuse and not in the least prominent; sides broadly arcuate, rather obliquely convergent to apex in apical fourth; apex obtuse and rather narrowly rounded; disk more strongly rounded laterally, arcuately declivous apically; punctures small and distinct, arranged in series, subequal in size, those of the series separated by a distance equal to one to three times their diameter; interstitial series widely spaced; intervals flat; punctures slightly less regular laterally and apically.

Under surface strongly and very densely punctate, each puncture with a small ferruginous seta. Legs moderately long and strongly sculptured; densely and asperately punctured, each puncture with a slightly longer seta, these becoming more hair-like on the distal part of the tibiæ. All the femora armed with a strong tooth, moderately stout and compressed; tibiæ notably slender, especially basally where they are distinctly arcuate, straight in apical half.

Male: Rather narrower; sides rather less arcuate; abdomen broadly impressed in middle third on first three segments.

Female: Broader, slightly inflated; somewhat wider behind the middle; abdomen moderately convex.

Length (types), 26-24.5 mm.; width 9.5-10 mm.

Loreto, May 20, 13 specimens: Angeles Bay, two specimens. The extremes of the series measure: Length 19-26 mm.; width 7.5-11 mm. The pair from Angeles Bay are very robust, rather less strongly sculptured beneath but just as densely so, the femora are rather broader and the third antennal joint is relatively stouter, while distally relatively slender. This pair apparently represent a race.

Type: Female, No. 1173, and *allotype*, male, No. 1174, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 20, 1921, at Loreto, Lower California. Paratypes in Academy collection and in that of the author.

A very distinct species of the *armata* section of the true *Eleodes*; from the other members it differs in its dense sculpturing of the under surface, stout femora and opaque surface.

76. *Eleodes vanduzeei* Blaisdell, new species

Form robust oblong-oval, a little more than twice as long as wide. Color black, opaque; tarsi piceous; lustre dull alutaceous. Punctures not distinctly setigerous.

Head moderate; front evenly convex, finely and sparsely punctate, with impunctate areas on the epistoma. Antennæ comparatively short, relatively slender in distal half; third and fourth joints noticeably heavier.

Pronotum about as long as wide, widest just in front of the middle; apex moderately emarginate, transverse in middle three-fourths, oblique laterally within the angles; the latter acute, moderate in size and anteriorly prominent; sides broadly and moderately strongly arcuate, slightly less so posteriorly; base quite truncate; basal angles obtuse, not in the least rounded; disk evenly convex, slightly more declivous antero-laterally, finely and sparsely punctate.

Elytra oblong-oval, truncate at base which is equal and adapted to the pronotal base; humeri obtuse, distinct and not in the least prominent; sides broadly and moderately strongly arcuate, obliquely converging to apex in apical fourth; apex obtuse, narrowly rounded, feebly emarginate at the suture; disk strongly convex from side to side, slightly depressed on dorsum; striae of small and distinct punctures which are not impressed and are separated by a distance equal to one or two times their diameter; intervals flat; interstitial punctures equal in size to those of the striae, widely spaced, finely asperate on central part of disk and toward base; laterally and apically becoming gradually muricate and distinctly spiculiferous on extreme sides and apical declivity.

Under surface very densely and moderately finely punctate. Legs stout and moderate in length; femora moderately broad and compressed, all armed with a broad tooth and very densely punctured; tibiae arcuate in basal half, straight in distal half and densely sculptured.

Male: Rather less broad; abdomen rather broadly impressed along the median line on first three segments.

Female: More robust; abdomen moderately and evenly convex.

Length (types), 22-26 mm.; width 8-11 mm.

Mulegé, May 14, 15, seven specimens.

Type: Female, No. 1175, and *allotype*, male, No. 1176, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 15, 1921, at Mulegé, Lower California. Paratypes in collection of the Academy and in that of the author.

A very distinct species and the only *Eleodes* known in which the interstitial punctures of the elytra become distinctly spiculiferous at the sides and on the apical declivity. I take great pleasure in naming this most interesting species after my friend Mr. E. P. Van Duzee.

77. *Eleodes (Promus) terricola* Blaisdell

Two specimens of this race of *insularis* Linell were taken by the expedition at Puerto Ballandara, Carmen Island, May 22. This race was previously referred to as the peninsular form of *insularis* in my monographic Revision of the Eleodiini (Bull. 63, U. S. Nat. Mus.). After seeing a larger series of specimens it was considered as a race of *insularis* as indicated above. It may again be defined as follows:

Body rather more convex than in *insularis*; elytral punctures stronger and the striæ more or less impressed, the intervals almost feebly convex. The tarsal spinules are ferruginous in *insularis* and darker in *terricola*.

The type of locality is El Taste, Lower California. Holotype, female, and allotype, male, in my own collection. This species has also been taken at San Francisquito, Lower California, by Mr. Gustav Beyer.

CONIONTINI

78. *Megasattus erosus* Horn

This large species was collected on Ceralbo Island, June 7. It has previously been taken at Patrocinio and Lower Purissima, Lower California. Six dead and imperfect specimens were picked up by the present expedition. In this species the elytra have a more or less sharp margin, the epipleura occupying only a part of the inflexed side; the latter is roughly sculptured. The sides of the pronotum are ciliate. The elytra are sculptured with coarse erosions and elevated smooth patches; longitudinal lines are more or less evident in some specimens.

In *costatus* Horn the elytra are costate and the intervals have fine smooth granules besides the punctures; sides of pronotum distinctly ciliate.

79. *Megasattus erosus manuelis* Blaisdell, new variety

Apparently this is a race of *erosus* Horn. Three specimens were secured on Espiritu Santo Island, May 31, by Mr. J. R. Slevin. The elytral margins are subacutely rounded; surface more polished and shining and the sculpturing much less strongly developed; the pronotal sides are not ciliate and the prosternal process is impunctate behind the coxæ. The head and pronotum are as in *erosus* Horn.

Three specimens were picked up dead and are more or less imperfect.

Length (types), 16-19 mm.; width 9.5-11.8 mm.

Type: Female, No. 1177, and *allotype*, Male, No. 1178, Mus. Calif. Acad. Sci., collected by Jos. R. Slevin, May 31, 1921, on Espiritu Santo Island, Gulf of California.

80. *Megasattus araneosus* Blaisdell, new species

Form oval, somewhat oblong. Color black and subopaque.

Head and pronotum finely and sparsely punctate; punctures denser towards the sides. Pronotal sides distinctly ciliate; disk narrowly explanate at sides; head not strong.

Elytral margins obtuse; disk not costate; sculpturing somewhat obsolete at base and along the suture to about the middle; punctate, punctures impressed, becoming irregular erosions which are not deep between the rather smooth intervals; these intervals become reticulate, more densely and strongly sculptured along the margins and on the apical declivity; inflexed sides somewhat strongly punctate and scarcely asperate. The sculpturing not strong and is somewhat eroded.

Prosternal process finely, more or less densely, but distinctly punctate.

Epipleura rather finely punctate.

Male: Narrower, sides more parallel.

Female: More oval, sides more arcuate.

Length (types), 14-15.5 mm.; width 7.5-9 mm.

South Santa Inez Island, nine specimens.

Type: Female, No. 1179, and *allotype*, male, No. 1180, Mus. Calif. Acad. Sci., collected by Jos. Chamberlin, May 13, 1921, at South Santa Inez Island, Gulf of California. Paratypes in Academy collection and in that of the author.

In a number of respects *araneosus* resembles *erosus* Horn, especially in the form of the head and pronotum; it differs, however, from the latter in the finely punctured prosternal process. The form also is less oval and the elytral sculp-

turing is not so strong and is not costate. All the specimens are imperfect, having been picked up dead or taken from spiders' webs. A female specimen has the elytra somewhat polished and the sculpturing is less coarse and more punctato-rugose. In most of the specimens the marginal cilia of the pronotum has been lost but enough remain to show that the margin is distinctly ciliate.

81. *Megasattus læviventris* Blaisdell, new species

Form, large, oblong to oval, quite strongly convex. Color deep black, surface polished, luster shining.

Head obsoletely, finely and sparsely punctate. Antennæ distinctly compressed; tenth joint transverse.

Pronotum strongly convex, impunctate except laterally along the rather narrowly explanate sides where the punctures are small and granulate; marginal bead strong; sides not ciliate.

Elytra oblong to oblong-oval, moderately strongly convex; lateral margins acutely rounded and very distinct; surface pitted with numerous more or less deep depressions which are larger and more or less coalescent at middle of the sides; intervals forming more or less wide, smooth, elevated patches or reticulations, which are much less coarse to somewhat obsolete toward base, along the suture and on the apical declivity; sutural interval smooth, impunctate and entire. In the smooth areas the punctures are more evident and sparse; inflexed sides obsoletely sculptured or smooth.

Propleura glabrous and longitudinally rugose as usual. No evidence of cilia. Abdomen, sternal sclerites and epipleura impunctate. Legs moderately long and relatively slender.

Male: Oblong-oval; sides parallel, less than moderately arcuate.

Female: Broadly oval, slightly widest behind the middle; sides more strongly arcuate.

Length (types), 18.5 mm.; width 11-12 mm.

Two specimens of this large and interesting species were collected on Santa Cruz Island, and at Escondido Bay. They are in a good state of preservation.

Type: Female, No. 1181, Mus. Calif. Acad. Sci., collected by I. M. Johnston, June 11, 1921, on **Santa Cruz Island, Gulf of California**; *Allotype*, male, No. 1182, collected by Jos. C. Chamberlin, June 14, 1921, at Escondido Bay, Lower California.

82. *Megasattus sternalis* Blaisdell, new species

Form oblong-oval to suboblong-oval and moderately strongly convex. Color deep black; lustre more or less shining; surface more or less polished.

Head finely and densely punctate; distinctly, transversely and rather broadly impressed between the anterior borders of the eyes along the frontal suture. Antennæ compressed as usual; eleventh joint distinctly smaller than the preceding joints.

Pronotum distinctly twice as wide as long; apex rather deeply sinuate between the narrowly rounded and slightly prominent anterior angles; base broadly arcuate in middle two-fourths, thence rather deeply and broadly sinuate to tip of basal angles which are produced posteriorly and subacute; sides rather broadly and rather strongly arcuate anteriorly, nearly straight and parallel posteriorly, posterior angles not at all divergent; disk moderately convex, finely and strongly punctate, punctures smaller centrally, becoming larger laterally; surface impressed along the lateral margins, narrowly anteriorly, widening posteriorly and involving the angles; impressed area finely granulato-punctate.

Elytra moderately convex and strongly sculptured, with numerous pits which are of moderate size, irregular in form and opaque at bottom between the smooth, rather wide, reticulated intervals; sutural interval strongly sculptured; lateral margin more or less obtusely rounded and the inflexed sides strongly sculptured; no evidence of costæ.

Propleura coarsely and strongly longitudinally rugose; distinctly ciliate beneath the marginal bead. Sterna and side pieces rather finely and densely punctate. Prosternal process strongly sculptured. Abdomen finely, rather sparsely punctate; punctures noticeably larger at sides of first segment; surface somewhat rugulose. Legs moderate in length and stoutness.

Male: Oblong-oval; sides parallel; elytra more strongly sculptured.

Female: More oval; slightly inflated and slightly widest behind the middle; sides arcuate; pronotal sides somewhat convergent to apex.

Length (types), 12.5-14 mm.; width 6.5-8.5 mm.

Type: Female, No. 1183, and *allotype*, male, No. 1184, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, May 7, 1921, at Angeles Bay, Lower California.

Sternalis is quite distinct from the previously described species and the differential characters probably can best be summarized in a revised synoptic statement:

Prosternal process distinctly punctate behind the coxæ; pronotal sides ciliate.....	1
Prosternal process not punctate nor margined behind the coxæ.....	2
1. Elytral sculpturing strongly developed throughout; lateral edge obtusely rounded.....	<i>sternalis</i> n. sp.
Elytral sculpturing eroded and less strongly developed; lateral edge acutely rounded.....	<i>arancosus</i> n. sp.

- | | |
|---|---------------------------|
| 2. Pronotal sides ciliate..... | 3 |
| Pronotal sides not ciliate; abdomen and inflexed sides of elytra
obsoletely sculptured and glabrous..... | <i>laviventris</i> n. sp. |
| 3. Elytra distinctly costate with interstitial smooth granules and
punctures..... | <i>costatus</i> Horn |
| Elytra not distinctly costate, although longitudinal lines may be
present; larger species..... | 4 |
| 4. Sculpturing strongly developed, longitudinal lines more or less
evident; elytral margin acutely rounded and prominent; adjacent
surface rather distinctly explanate..... | <i>erosus</i> Horn |
| Sculpturing less developed; surface more polished and shining
..... | <i>manuelis</i> n. var. |

In all the elytra have a distinct lateral margin, the epipleura forming only a part of the inflexed sides. In many of the specimens studied the pronotal cilia have for the most part been rubbed or broken off, but stubs and punctures remaining to indicate their reality.

83. *Eusattus puncticeps* Blaisdell, new species

Form oblong-oval, moderately inflated posteriorly, strongly convex. Color deep black, above rather dull in lustre, beneath more or less shining. Surface obsoletely sculptured and smooth.

Head very densely punctate; punctures moderately small and scarcely impressed. Epistoma very feebly and broadly sinuate at apex; lobes feebly arcuate.

Pronotum scarcely twice as wide as long; apex rather deeply sinuate in circular arc; apical angles subacute and not prominent; base truncate; basal angles posteriorly produced and subacute, inner margins oblique; sides broadly and feebly arcuate, less so posteriorly and parallel, slightly convergent anteriorly; disk rather strongly convex, very finely and sparsely obsoletely punctulate, marginal bead strong; sides of disk scarcely impressed except slightly on posterior angles.

Elytra about a third longer than wide, smooth and impunctate; sides moderately arcuate, apex obtusely rounded; disk moderately convex on dorsum and rather broadly rounded laterally to the epipleura; rather abruptly and arcuately declivous posteriorly.

Prosternum finely and distinctly punctate; process short, margined throughout and punctured; propleura smooth and not rugose. Sterna finely and more or less feebly punctate. Abdomen moderately and evenly convex, glabrous, finely, very sparsely and obsoletely punctate. Legs relatively short. Described from the unique type.

Length (type), 12 mm.; width, 6.6 mm.

Type: Sex undetermined, No. 1185, Mus. Calif. Acad. Sci., collected by Virgil Owen, July 7, 1921, at San Pedro Bay, Sonora, Mexico.

Puncticeps is related to *secutus* Horn, which is at hand. In *puncticeps* the head is very densely punctured, the epistoma broadly and feebly sinuate with the lobes scarcely arcuate, the oblique sutures with small emarginations. In *secutus* the head is much less densely punctate and the epistoma is very feebly triangularly emarginate with the lobes strongly arcuate from the bottom of the emargination. In *puncticeps* the prosternum is strongly punctured and the process is margined throughout, closely but not coarsely punctate and the surface is somewhat convex; in *secutus* the prosternum is very strongly convex and finely punctate anteriorly, the process strongly margined throughout, perfectly flat on the disk and coarsely punctate, the punctures more or less coalescent.

BLAPSTINI

84. *Blapstinus aridus* Blaisdell, new species

Form oblong-oval, about two and a half times longer than wide, moderately convex. Color piceous black; antennæ and legs dark rufous; feebly shining. Pubescence sparse, fine, recumbent and rather noticeable. Wings well developed.

Head scarcely convex and not impressed, sutures not visible; epistoma feebly and broadly emarginate, angles rounded into the sides of the front which are feebly arcuate and moderately convergent; rather evenly punctate; punctures moderately small and well separated. Antennæ moderate in length; outer joints slightly compressed, feebly incrassate.

Pronotum about a half wider than long, very moderately and evenly convex; apex slightly and broadly emarginate; apical angles obtusely rounded; sides broadly and feebly arcuate, a little more strongly so in anterior half and slightly convergent; basal angles obtuse and not in the least rounded; base broadly and feebly arcuate in central two-fourths, thence sinuate to the angles; disk rather evenly punctured centrally, punctures moderate in size and separated by a distance equal to one to two times their diameter, becoming a little coarser and somewhat more deeply impressed laterally where they are more oval, not coalescent, with the intervals equal to about one-half the width of the punctures.

Elytra almost twice as long as wide; base feebly emarginate in middle two-fourths, a little wider than pronotal base; humeri obtuse, scarcely distinct; sides subparallel, feebly arcuate; apex obtusely rounded; disk feebly convex on dorsum, with regular striæ of moderate punctures which are not impressed and are separated by a distance equal to one and one-half to twice their diameter; intervals flat throughout and minutely, irregularly and sparsely punctate.

Propleura longitudinally rugose. Abdomen not very sparsely and rather feebly punctate. Legs moderate.

Male: Protarsi moderately dilated; second joint a little longer than third, the latter more strongly sinuate at apex, both transverse and equal in width; first three joints densely spongiose beneath; mesotarsi slightly dilated; first two joints slightly spongiose beneath. Abdomen distinctly impressed at middle on first three segments; fifth slightly impressed.

Female: Rather broader. Abdomen more convex.

Length (types), 5.7-5.8 mm.; width 2-2.2 mm.

Guaymas, April 8, one pair, the female imperfect.

Type: Male, No. 1186, and *allotype*, female, No. 1187, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 8, 1921, at Guaymas, Sonora, Mexico.

This species might be confused with *rufipes* Casey and *coronadensis* Blaisd., both occurring along the Mexican boundary, the former having been taken in northern Lower California. *Rufipes* is more convex, the elytral striæ are noticeably impressed and in the male the protarsi are more broadly dilated. In *coronadensis* the three distal antennal joints are slightly less compressed and a little wider than the preceding joints; in the male the protarsi are a little more widely dilated and the abdominal impression is feebler and less defined. I have been unable to recognize *aridus* among the species listed in the Biologia. The types of *aridus* are normally pigmented and therefore cannot be confounded with mature examples of the species with black legs.

85. *Blapstinus paradoxus* Blaisdell, new species

Form oblong-oval, a little less than $2\frac{1}{2}$ times longer than wide, rather moderately and evenly convex. Color piceous black; legs piceous. Feebly shining. Pubescence fine, sparse, brownish and inconspicuous. Wings not examined.

Head slightly and rather evenly convex; epistoma rather deeply emarginate, emargination evenly arcuate; angles rounded into the feebly arcuate sides of the front which are moderately convergent anteriorly; sutures obsolescent; punctures moderately small, separated, somewhat smaller and denser on the epistoma. Antennæ moderate in length and slightly stout, slightly incrassate in last four joints, last three noticeably compressed, tenth slightly transverse, eighth about as long as wide and scarcely widened.

Pronotum about a half wider than long, less than moderately and evenly convex; apex feebly emarginate; angles obtusely rounded; base

rather deeply bisinuate; sides subparallel, not strongly arcuate anteriorly and slightly convergent; basal angles rectangular; disk rather evenly punctured centrally, punctures separated, becoming slightly larger and deeper laterally where the intervals are flat and narrower; basal impressions feeble.

Elytra scarcely twice as long as wide, almost evenly convex but not strongly convex from side to side; base quite equal to pronotal base; humeri obtuse; sides feebly arcuate and parallel, obtusely and rather broadly rounded at apex; disk with distinct rows of moderate punctures which become slightly coarser laterally and the striae slightly impressed; intervals flat on dorsum, feebly convex laterally and on apex, finely, sparsely and irregularly punctate.

Propleura rather strongly longitudinally rugose. Abdomen convex, sparsely, rather regularly punctate; punctures small and distinct. Legs moderate.

Length (type), 6 mm.; width 2.3 mm.; San Pedro Bay, a single specimen.

Type: Female, No. 1188, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, July 7, 1921, at **San Pedro Bay, Sonora, Mexico.**

This species differs distinctly from *aridus* in its more deeply emarginate and densely punctate epistoma. It is also larger and slightly more convex. *Sonoræ* Casey is a much larger species with the sides of the pronotum more strongly arcuate from apex to base; a single specimen of *sonoræ* is at hand. *Paradoxus* evidently is not recorded in the Biologia.

86. *Blapstinus amnosus* Blaisdell, new species

Form oblong-oval, rather less than moderately convex. Color dark piceous, legs somewhat lighter; surface slightly shining. Pubescence slightly coarse, almost conspicuous fuscous and recumbent. Wings well developed.

Head moderately convex, especially about the eyes; epistoma feebly and broadly emarginate; angles rounded into sides of front which are quite straight and distinctly convergent anteriorly; epistoma slightly convex; punctures separated, rather small and almost evenly distributed. Antennæ moderate in length and rather slender; even four joints slightly wider, feebly compressed.

Pronotum transversely oblong, about a half wider than long; apex feebly emarginate, transverse in middle three-fifths; apical angles slightly prominent anteriorly and obtusely rounded; base broadly arcuate in about middle three-fifths, sinuate laterally; sides parallel, very feebly arcuate, more strongly so and converging anteriorly; basal angles almost rectangular; disk evenly and not strongly convex; punctures rather strong throughout, having a slight tendency to coalesce in the lateral area.

Elytra oblong-oval, not quite twice as long as wide; base very little wider than pronotal base, humeri obtuse; sides parallel in basal half, thence feebly arcuate, becoming more strongly so as the apex is attained, the latter obtusely rounded; disk very feebly convex on dorsum; punctures arranged in distinct rows and almost slightly impressed, moderately small but well defined; separated by a distance equal to about two times their own diameter; striæ rather more strongly impressed laterally and on apex, sparsely, minutely and distinctly punctate.

Propleura longitudinally rugose. Abdomen rather strongly punctate; punctures well defined. Legs moderate.

Male: A little narrower. Protarsi moderately strongly dilated, rather gradually increasing in width from first to third, the latter apparently a little wider than the second, all three densely spongiose beneath; mesotarsi feebly dilated, first joints spongiose beneath. Abdomen not strongly impressed on first three segments; fifth feebly impressed at apex. Female: Slightly broader. Abdomen more convex.

Length (types), 5.6-5.8 mm.; width 2.3-2.6 mm.

Angeles Bay, eight specimens.

Type: Female, No. 1189, and *allotype*, male, No. 1190, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 5, 1921, at Angeles Bay, Lower California. Paratypes in Academy collection and in that of the author.

Amnosus differs from the other species in its rather darker color, stronger punctuation, more convergent and straighter sides of the front, and slightly different protarsi in the male. Not recognized among the species reviewed and described in the *Biologia*. *Amnosus* is less convex than *rufipes* and in the latter the protarsi are strongly dilated.

87. *Conibius opacus* LeConte

A long series of specimens have been referred to this species. There is considerable variation exhibited among those taken on the various islands but the variants are connected by intermediates which render specific separation impossible and varietal grading unwise. This interesting material was secured in the following localities: San Diego Island, June 11; Tortuga Island, June 22; Santa Cruz Island, June 11; Santa Catalina Island, June 12; Loreto, May 20; Angeles Bay, May 7; Las Animas Bay, May 8; Puerto Ballandra, Carmen Island, May 21; San Nicolas Bay, May 17; San Pedro Bay, July 7; San Pedro Nolasco Island, April 17. Those from San Nicolas Bay, San Pedro Nolasco Island and Santa Catalina Island present the greatest amount of variation.

Opacus is characterized by the oval elytra, the lateral edges visible throughout from above and finely reflexed, more noticeably so near the base and toward apex. The elytra may have the striæ more or less slightly impressed and there very feebly sulcate. The type locality for the species is Cape San Lucas. The protibiæ are straight and scarcely dilated and the luster is dull. The series collected by the expedition has been compared with a series taken at Santa Rosa, Lower California.

88. *Conibius reflexus* Horn

A small series was taken on Ceralbo Island, June 7. Casey considers this species not different from *opacus* Lec. I believe his opinion was based on too small a series.

89. *Conibius ventralis* Blaisdell, new species

Form oblong-oval, moderately strongly convex, slightly more than twice as long as wide. Color black; antennæ and legs rufo-piceous; luster dull.

Head moderately convex; eyes sunken; frontal suture more or less distinct; epistoma broadly and rather feebly emarginate, thence broadly arcuate with the sides of the front; coarsely and closely punctate; punctures more or less coalescent, those of the epistoma smaller and well separated. Antennæ rather robust; distal three joints transverse.

Pronotum about a half wider than long; apex rather deeply and broadly emarginate, almost slightly arcuate in middle three-fifths; apical angles rather prominent anteriorly and subacute; sides broadly and slightly arcuate in anterior two-thirds, rather straight and slightly convergent in basal third; basal angles obtuse to almost rectangular; base broadly and feebly lobed in middle three-fifths, thence sinuate to the angles; disk moderately convex, somewhat impressed along the sides which are scarcely explanate, coarsely and densely punctate; punctures coalescing more or less longitudinally, forming rugæ throughout except along apex.

Elytra not twice as long as wide; oblong-oval, moderately convex antero-posteriorly and rather abruptly arcuately declivous posteriorly; base truncate, humeri obtuse; sides broadly and evenly, feebly arcuate to the obtusely rounded apex; disk finely striate; striæ of shallow moderately small punctures, separated by a distance equal to two times their diameter; intervals flat to feebly convex laterally and on apex, minutely sparsely punctate.

Propleura longitudinally rugose. Abdomen strongly punctate, punctures almost coarse and abundant, more or less rugulose. Legs moderate in length, rather stout and quite strongly sculptured.

Male: Abdomen strongly and rather deeply impressed on first three segments in middle third, impression distinctly defined. Protibiæ straight,

gradually widened to apex which is twice the width of base. First joint of protarsi with a rounded tuft of yellowish pubescence.

Female: Abdomen rather evenly convex. Protibiæ stout and gradually widened from base to apex.

Length (types), 5.8-5.5 mm.; width 2.2-2.4 mm.

Espiritu Santo Island, a small series.

Type: Male, No. 1191, and *allotype*, female, No. 1192, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 9, 1921, on Espiritu Santo Island, Gulf of California.

Ventralis resembles *reflexus* in its dull black luster, but differs in the strongly punctured abdomen and the strong abdominal impression in the male. In *reflexus* the first two joints of the protarsi have dense and rather transverse pads of yellow pubescence.

In *opacus* the abdomen in the male is very feebly and rather narrowly impressed. The protarsi are more widely dilated and the first two joints have a pad of yellow pubescence. In *sulcatus* the protarsi of the male are without pubescent pads and the abdominal impression is shallow. In *ventralis* the margin is quite visible from above and scarcely reflexed at base and near apex.

90. *Conibius gagates* Horn

A small series was taken at Guaymas, April 10. This species is very distinct from the others by its deep black color, dull velvety luster and broad explanate sides of the pronotum.

91. *Nocibiotes granulatus* LeConte

This series was secured at Tepoca Bay, April 25; Puerto Ballandra, Carmen Island, May 27; and at Las Animas Bay, May 8.

In *granulatus* the elytra are deeply striate, the intervals convex and muricately punctured. In the male the protibiæ are very gradually widened from base to middle, below which they are suddenly arcuate, causing them to appear toothed. *Granulatus* also occurs at Ft. Yuma, California, and in Arizona.

92. *Tonibius sulcatus* LeConte

A series of nine specimens was obtained at the following places : Isla Partida, April 22; Angeles Bay, May 5 and at Pond Island, July 1, the latter taken by Mr. J. C. Chamberlin.

Sulcatus is common in San Diego County, California, and in northern Lower California; it is also found in Arizona. The pronotum is subquadrate, elytra elongate oval and deeply striate, the striae coarsely punctured; intervals convex and sparsely punctured.

PHALERIINÆ

93. *Phaleria pilifera* LeConte

A large series was taken at the following localities: Angeles Bay, June 26, where it occurred in untold thousands on the sand beach after dark at night; Mejia Island, April 30; Granite Island, May 2; Freshwater Bay, Tiburon Island, April 23; Tepoca Bay, April 25; Las Animas Bay, May 8; and Puerto Refugio, Angel de la Guardia Island, May 1. It also occurs at Cape San Lucas and at Yuma, Arizona. The color is variable, testaceous to entirely black, or the elytral and pronotal borders alone may be pale. It is a moderately depressed species and the borders of the elytra and pronotal sides are fringed with hairs. Not mentioned in the *Biologia*.

94. *Phaleria latus* Blaisdell, new species

Form oblong-elliptical, somewhat robust and convex. Color, brownish to piceous, brownish testaceous or testaceous, in the latter case the elytral disks may be brownish.

Head rather less than one-half the width of the pronotum, transversely and broadly impressed between the anterior borders of the eyes; epistoma truncate at apex; frontal sutures obsolete; sides of front arcuately prominent at the eyes, becoming straight and converging to the obtuse lateral angle; surface finely and very sparsely punctate. Eyes not in the least prominent. Antennæ stout; joints 7-10 inclusive transverse, quite gradually clavate.

Pronotum rather transversely oblong, widest at anterior third; less than twice as wide as long; apex moderately sinuate in nearly circular arc; apical angles obtuse, slightly blunt; base quite truncate, margined; basal angles obtuse, distinct; sides moderately arcuate anteriorly, feebly so posteriorly where they are slightly convergent to the base; disk moderately and evenly convex, very finely and very sparsely punctate.

Elytra oblong, about a fourth longer than wide; base just a little wider than pronotal base; humeri obtuse, angle small and distinct; sides broadly and moderately arcuate, broadly rounded at apex, at times widest slightly behind the middle; disk distinctly striate, striæ impressed, rather more strongly so at apex, impunctate; intervals slightly convex, very finely and sparsely punctate.

Propleura with very sparse, small asperate punctures and scattered hairs along the pronotal margin; prosternum with a broad loose tuft of long hairs at middle near apical border. Epipleura with fine and very sparse setigerous punctures; setæ hair-like. Abdomen finely and sparsely punctured; punctures somewhat coarse laterally; each segment with a line of setigerous punctures along apical margin; setæ moderately long and backwardly directed. Legs moderately short; outer angle of protibiae broadly rounded, lateral edge apparently entire but with a row of short broad spinules backwardly directed and not visible from the front.

Male: Rather less broad than the female with less arcuate sides.

Length (types), 7-7.9 mm.; width 3.5-3.8 mm.

San Luis Island, April 27; Gonzales Bay, April 28, a fair series.

Type: Female, No. 1193, and *allotype*, male, No. 1194, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 27, 1921, on **San Luis Island, Gulf of California**. Paratypes in Academy collection and in that of the author.

Latus is broader and stouter than any of our west coast species found north of the Mexican boundary. It does not agree with any of the species given in the *Biologia*.

DIAPERINÆ

95. *Platydema subquadratum* Motschulsky

One specimen was taken on San José Island, May 28. This species has a closely punctured head, a regular and distinct pronotal punctuation and a somewhat depressed subquadrate form; the epipleura, legs and under surface are pale ferruginous; the antennæ red with the intermediate joints darker. Length 4-7 mm. A common species in Mexico, Nicaragua, Guatemala, and extending northward into California, Arizona and New Mexico.

ULOMINÆ

96. *Echocerus angelicus* Blaisdell, new species

A considerable series (33 specimens) of a species quite different from those given in the *Biologia* was taken at Angeles Bay by Mr. J. C. Chamberlin. It may be defined as follows:

Male: Form elongate, parallel, rather more than three times as long as wide. Color pale ferruginous to testaceous.

Head finely and very sparsely punctate, smooth; vertex with slightly larger and more numerous punctures; mandibles armed above with long, erect, sickle-shaped incurved horn; interocular region transversely raised into an arcuate ridge which forms a small subacute tubercle at the ocular margin, more acutely raised at the middle and sinuate on the median line; front below concave; sides of front before the eyes moderately prominent, not more so than the eyes, more strongly arcuate anteriorly.

Pronotum about a fourth wider than long, evenly convex; apex subtruncate, angles feebly rounded; sides broadly and not strongly arcuate, parallel; marginal bead fine; base feebly arcuate, almost subtruncate; angles obtuse; disk extremely narrowly impressed within the bead; evenly and not closely punctate, punctures moderately small.

Elytra oblong-oval, parallel, rather broadly rounded at apex; disk finely striate; humeri obtuse; intervals finely and irregularly punctate.

Propleura densely and not coarsely, subasperately punctate. Abdomen finely and sparsely punctate, punctures dense at the sides; fifth segment transversely and rather deeply impressed across the base.

Female: Head simply, broadly impressed before the eyes.

Length (types), 4 mm.; width 1.2-1.4 mm.

Type: Male, No. 1195, and *allotype*, female, No. 1196, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, June 27, 1921, at Angeles Bay, Lower California. Paratypes in Academy collection and in that of the author.

Analisis Champion, described in the *Biologia*, is black with the apical third of the elytra red. In *marillosus* Fabricius, which is before me, the mandibular horns are shorter, broader and less sickle-shaped, and the front is bituberculate and without an interocular arcuate ridge. *Marillosus* is smaller than *angelicus*.

97. *Latheticus prosopis* Chittenden

A series of 18 specimens was collected at Marquer Bay, Carmen Island, May 23, by Mr. Chamberlin and Mr. Van Duzee. They were found beneath the bark of dead mesquite. Chittenden reports the species having been taken in the same way at Indio, California, and Hot Springs, Arizona. The species measured 2.7-3 mm. in length, and .7-.75 mm. in width. The color is pale brownish yellow; front of head very convex and the antennæ glabrous, the last five joints transverse, the eleventh truncate at apex. The narrow parallel

form is suggestive of *Hypophlæus* but it is related to *Tribolium*. In some of the specimens the fourth and fifth ventral segments are black. The prosternum in the above series is very sharply punctate and the elytral striæ of punctures are not very distinct.

98. *Mycotrogus mentalis* Blaisdell, new species

Eighteen specimens were collected by the expedition. The characters presented by these agree with Horn's definition of the genus *Mycotrogus*. The prosternum is prolonged and mucronate and the mesosternum is deeply emarginate. The head is tuberculate and the epipleura are entire and nearly as broad at apex as at the middle. The femora are somewhat compressed and the protibiæ are gradually widened to apex with the outer edge rather thick and rounded. Body winged. The species does not agree with *piccus* or *angustus* described by Horn and may be characterized as follows:

Form elongate oblong-oval, parallel, about two and a half times longer than wide, moderately depressed, only moderately convex. Color piceous, dark rufous beneath.

Head slightly convex, not closely punctate; punctures rather coarse on front of vertex, about half as large elsewhere; epistoma subtruncate; sides of front convergent and feebly arcuate and passing into the more strongly arcuate sides of the epistoma; frontal sutures slightly indicated with the surface rather feebly and broadly impressed along them. Eyes not prominent, a little less so than the sides of the front; a supraorbital carina is not present. Antennæ moderate in length, stout; third joint longer than fourth; joints seven to ten inclusive transverse.

Pronotum about a third wider than long, moderately strongly convex; apex broadly and moderately deeply emarginate, rather transverse in middle one-half; apical angles rather broadly rounded; sides broadly and moderately arcuate, marginal bead coarse and slightly reflexed; base arcuate in middle third, broadly and rather strongly sinuate laterally; basal angles subacutely rounded and rather prominent posteriorly; disk very narrowly impressed along the sides, the impression widening somewhat to the basal angles; basal impression short and rather linear, not strong, with an obsolete median line; rather sparsely punctate, punctures small and coarse intermixed in lateral third, rather fine and of one size in middle third.

Elytra oblong-oval, about twice as long as wide; base feebly trisinate, equal to pronotal base; humeri obtuse; basal margin at humeri impressed to receive the basal angles of the pronotum; sides parallel, feebly arcuate becoming more strongly so and passing into the broadly rounded apex; margin narrowly explanate and feebly reflexed; disk with eight entire

striae of moderate punctures; scutellar row more or less obsolete; intervals very sparsely and finely punctulate; slightly convex laterally, eighth noticeably so. Scutellum triangular and with few small punctures in central area.

Propleura sparsely punctured and more or less rugulose. Abdomen finely and very sparsely punctate centrally, punctures coarse at sides of the segments. Legs moderate in length, femora stout; first joint of the metatarsi longer than the second and third taken together.

Male: Small rounded tubercle above each eye; mentum convex and flattened on summit, with a rounded setigerous puncture at center; flattened area impunctate.

Female: Front not tuberculate. Mentum nearly as in male but not flattened; setigerous punctures not present; surface closely punctate.

Length (types), 4.8-5 mm.; width 1.7-1.9 mm.

Las Animas Bay, May 8; Angeles Bay, June 27.

Type: Male, No. 1197, and *allotype*, female, No. 1198, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, May 8, 1921, at Las Animas Bay, Lower California. Paratypes in Academy collection and in that of the author.

99. *Merotemnus elongatus* Horn

Two specimens of this fine species were found at Angeles Bay, May 4, and on San José Island, May 23. In the Leng Catalogue *elongatus* is given as a synonym under *filiformis* Cast. As this is only a record I shall not discuss that point. The species is shining ferruginous brown and elongate; the femora are clavate and flattened, emarginate at tip with a broad tooth at the emargination on the meso- and meta-femora. I possess a single specimen collected at San José del Cabo, Lower California.

100. *Ulosonia marginata* LeConte

A small series of eight specimens was taken at Puerto Ballandra, Carmen Island, May 22, by Mr. Virgil Owen; Pelican Island, July 5, J. C. Chamberlin, San José Island, May 28, E. P. Van Duzee.

The males of the series have the head armed with two moderately long horns. The species is elongate oblong and depressed. The horns apparently vary in length in different individuals. In the type the head is armed with two tubercles only. I have before me a male that was collected at Needles,

California, which has the head armed with two porrect horns as are the males of the above series; three other specimens taken at Needles have the head simply tuberculate. Was the species founded on a female? This question must be answered at some other time. The series studied show variation in the length of the cephalic horns.

TENEBRIONINÆ

101. *Rhinandrus sublævis* Horn

A series of seven specimens was taken by Mr. Virgil Owen and Mr. J. C. Chamberlin, at the following places: San Pedro Bay, July 7; Willard's Point, Tiburon Island, July 3; Bay at south end of Tiburon Island, July 5. This species has not previously been reported from Mexican territory. Four species of *Rhinandrus* are known in Mexico and Champion considers that *sublævis* Horn is closely allied to *obsoletus* Champ. *Sublævis* is winged and has distinct humeri, and the general facies of *Alobates pennsylvanicus* DeG. It was described from Arizona. Specimens are before me that were collected at Nogales and Phoenix, Arizona.

102. *Eupsophulus castaneus* Horn

A widely distributed species, occurring in Nevada, Arizona, southern California and Lower California. During the present expedition it was taken on San Esteban Island, April 20, at Guaymas, April 10 and at Angeles Bay. Seven specimens were secured. Another species, *Eupsophulus horni* Bates occurs in Mexico. It differs by the very close and uniform punctuation.

ADELIINÆ

TRICHO DERULUS Blaisdell, new genus

Mentum as long as wide, trilobed; middle lobe triangular at apex, lateral lobes rather small; last joint of maxillary palpi triangular; epipleura narrow; body clothed with long hairs. First joint of hind tarsi as long as the two following. Elytra caudate and the profemur dentate in the male.

This genus will in all probability include *Amphidora caudata* Horn. Unfortunately *caudata* is not at hand. Horn foresaw the possibility of erecting a new genus for that species. The discovery of another closely related species at Guaymas by Mr. Van Duzee shows the necessity of erecting a new genus as above. *Trichoderulus* must follow *Amphidora* in the sequence of the genera. Type of genus, *Trichoderulus longipilosus* Blaisdell, n. sp.

103. *Trichoderulus longipilosus* Blaisdell, new species

Form elongate oblong-oval to elongate-oval. Color deep black, shining and polished; clothed with quite long black or brownish-black hairs.

Pronotum about as wide as long, widest just before the middle; apex truncate in circular arc; apical angles obtuse; base truncate; angles obtuse, distinct and not in the least rounded; sides rather strongly rounded in anterior two-thirds, gradually narrowed to base; disk strongly convex, arcuately declivous at apical angles, rather abruptly declivous at sides in front of middle; coarsely and deeply punctate; punctures rather widely separated in central area, considerably denser laterally.

Elytra elongate-oval, base truncate and a little wider than pronotal base; humeri distinct, angle obtuse; sides moderately arcuate; disk moderately strongly convex, less so on dorsum, with rows of rather coarse and quite closely placed punctures; intervals with a single series of small and slightly more widely spaced punctures; each puncture of both series with a long hair.

Abdomen very coarsely and quite densely punctate and more or less rugose.

Male: More oblong-oval; caudate; cauda equal to last two abdominal segments; profemora with a small acute tooth between the middle and apex. Abdomen less convex.

Female: Elongate-oval, not caudate; elytra with a tendency to be widest behind the middle; profemora mutic. Abdomen more convex.

Length (types), 14-13 mm. (including the cauda); width 4.5-5 mm.

Guaymas, April 8, a large series taken from under stones in a barn yard.

Type: Male, No. 1199, and *allotype*, female, No. 1200, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 8, 1921, at Guaymas, Sonora, Mexico. Paratypes in Academy collection and in that of the author.

T. longipilosus seems to be quite distinct from *caudata* Horn. In *caudata* the hairs are more brownish, the pronotum is broader than long, the elytra with striæ of rather distantly placed punctures and the abdomen coarsely and sparsely punctate. For further consideration of the genus *Amphidora* the student is referred to Horn's Revision of the Tenebrionidæ, page 327. The following synoptical statement may be presented at the present time:

Epipleura narrow. Other joints of antennæ subglobose; first joint of metatarsi as long as the two following; intercoxal process broad and truncate.

Prosternum produced behind the coxæ; mesosternum prominent; pronotum broader than long; abdomen sparsely punctate	<i>caudata</i> Horn
Prosternum not produced; mesosternum declivous; pronotum as wide as long; abdomen densely punctate and more or less rugose	<i>longipilosa</i> n. sp.

Distribution by Localities

ISLANDS

- Angel de la Guardia: *Anepsius confluens* n. sp.; *Cryptoglossa granulifera* Champ.; *Hylocrinus oblongulus* Csy.; *Phaleria pilifera* Lec.; *Steriphanus alutaceus* Csy.; *Tonibius sulcatus* Lec.; *Triphalopsis minor*.
- Carmen: *Argoporis inconstans* Horn; *Centrioptera asperata* Horn; *Centrioptera discreta* n. var.; *Centrioptera pectoralis* Blais.; *Cerenopus concolor* Lec.; *Conibius opacus* Lec.; *Cryptadius angulatus* n. sp.; *Cryptadius sinuatus* n. sp.; *Eleodes lorentensis* n. sp.; *Eleodes terricola* Blais.; *Emmenides obsoletus* n. sp.; *Hylocrinus insularis* n. sp.; *Latheticus prosopis* Chit.; *Metoponium laticolle* Csy.; *Noci-biotes granulatus* Lec.; *Telabis latipennis* n. sp.; *Trimytis obtusa* Horn; *Ulosonia marginata* Lec.
- Ceralbo: *Centrioptera asperata* Horn; *Centrioptera seriata* Lec.; *Centrioptera subornata* n. sp.; *Conibius reflexus* Horn; *Emmenides apicalis* n. sp.; *Heterasida connivens* Lec.; *Megasattus erosus* Horn; *Sibia puncticollis* Horn; *Telabis lunulata* n. sp.; *Trimytis obtusa* Horn; *Triphalus subcylindricus* n. sp.
- Coronados: *Centrioptera discreta* n. var.
- Espiritu Santo: *Centrioptera asperata* Horn; *Centrioptera discreta* n. var.; *Centrioptera spiculifera* Lec.; *Cerenopus cribratus* Horn; *Conibius ventralis* n. sp.; *Emmenides subdescalceatus* n. sp.; *Megasattusmanuelis* n. var.; *Orthostibia frontalis* n. sp.; *Trimytis obtusa* Horn.
- Georges: *Triorophus laevis* Lec.
- Granite: *Phaleria pilifera* Lec.
- Ildefonso: *Centrioptera planata* n. var.; *Emmenides subdescalceatus* n. sp.; *Sibia cribrata* n. sp.
- Isla Partida: *Anepsius confluens* n. sp.; *Argoporis inconstans* Horn; *Asidina parallela* Horn; *Centrioptera sculptiventris* n. sp.; *Craniotus pubescens* Lec.; *Cryptoglossa granulifera* Champ.; *Steriphanus subopacus* Horn; *Sibia sparsa* n. sp.; *Tonibius sulcatus* Lec.; *Triphalopsis partida* n. sp.
- Isla Raza: *Anepsius confluens* n. sp.; *Argoporis inconstans* Horn.
- Mejia: *Anepsius confluens* n. sp.; *Cryptoglossa granulifera* Champ.; *Phaleria pilifera* Lec.; *Triphalopsis partida* n. sp.
- Monserrate: *Centrioptera inornata* n. sp.; *Centrioptera spiculifera* Lec.; *Cerenopus concolor* Lec.; *Eleodes inflata* n. sp.; *Eleodes terricola* Blais.; *Sibia puncticollis* Horn.
- Patos: *Centrioptera variolosa* Lec.; *Steriphanus subopacus* Horn; *Trichoderulus longipilosa* n. sp.; *Triorophus laevis* Lec.; *Triphalopsis partida* n. sp.
- Pelican: *Telabis punctulata* Lec.; *Ulosonia marginata* Lec.
- Sal si Puedes: *Argoporis inconstans* Horn; *Centrioptera chamberlini* n. sp.; *Steriphanus subopacus* Horn.
- San Diego: *Centrioptera asperata* Horn; *Centrioptera discreta* n. var.; *Conibius opacus* Lec.; *Emmenides subdescalceatus* n. sp.; *Triphalus subcylindricus* n. sp.

- San Esteban: *Eupsophulus castaneus* Horn; *Steriphanus estebani* n. sp.;
Steriphanus tardus n. sp.; *Steriphanus torpidus* n. sp.
- San Francisco: *Centrioptera discreta* n. var.; *Cerenopus concolor* Lec.
- San José: *Centrioptera discreta* n. var.; *Merotemnus elongatus* Horn;
Platydemia subquadratum Mots.; *Ulosonia marginata* Lec.
- San Lorenzo: *Centrioptera chamberlini* n. sp.; *Steriphanus subopacus*
Horn; *Sibia sparsa* n. sp.; *Triphalopsis minor* n. sp.; *Triphalopsis*
partida n. sp.
- San Luis: *Phaleria latus* n. sp.
- San Marcos: *Edrotes mexicanus* n. sp.
- San Pedro Martir: *Argoporis* sp.
- San Pedro Nolasco: *Argoporis æqualis* n. sp.; *Conibius opacus* Lec.;
Steriphanus subopacus Horn.
- Santa Catalina: *Centrioptera subornata* n. sp.; *Conibius opacus* Lec.;
Emmenides catalinæ n. sp.; *Stethasida catalinæ* n. sp.; *Sibia granu-*
lata n. sp.
- Santa Cruz: *Conibius opacus* Lec.; *Megasattus læviventris* n. sp.
- Santa Inez: *Asidina terricola* n. var.; *Megasattus araneosus* n. sp.;
Sibia sparsa n. sp.; *Telabis hirtipes* n. sp.; *Triphalopsis minor*, n. sp.
- Tiburon: *Centrioptera sculptiventris* n. sp.; *Centrioptera variolosa*
Horn; *Metopoloba densiventris* Csy.; *Phaleria pilifera* Lec.; *Rhinandrus*
sublævis Horn; *Steriphanus mucronatus* n. sp.; *Triphalopsis*
partida n. sp.
- Tortuga: *Conibius opacus* Lec.; *Sibia sparsa* n. sp.
- West Galleras: *Centrioptera subornata* n. var.

PENINSULA

- Agua Verde: *Cerenopus cribratus* Lec.
- Angeles Bay: *Blapstinus amnosus* n. sp.; *Centrioptera dulzuræ* Blais.;
Centrioptera pectoralis Blais.; *Chilometopon rugiceps* n. sp.; *Crypta-*
tadius tarsalis n. sp.; *Echocerus angelicus* n. sp.; *Hylocrinus liber-*
tus n. sp.; *Hylocrinus oblongulus* Csy.; *Merotemnus elongatus* Horn;
Metoponium angelicum n. sp.; *Mycotrogus mentalis* n. sp.; *Steri-*
phanus durus n. sp.; *Telabis lunulata* n. sp.; *Telabis serrata* Lec.;
Triphalopsis minor n. sp.
- Concepcion Bay: *Trimytilis obtusa* Horn.
- Escondido Bay: *Argoporis longipes* n. sp.; *Asidopsis divaricata* n. sp.;
Centrioptera pectoralis Blais.; *Centrioptera subornata* n. var.;
Megasattus læviventris n. sp.
- Gonzales Bay: *Phaleria latus* n. sp.
- Las Animas Bay: *Argoporis inconstans* Horn; *Conibius opacus* Lec.;
Metoponium angelicum n. sp.; *Mycotrogus mentalis* n. sp.; *Noci-*
biotes granulatus Lec.; *Phaleria pilifera* Lec.; *Telabis punctulata*
Lec.; *Telabis serrata* Lec.
- La Paz: *Metoponium pacificum* n. sp.
- Loreto: *Anepsius angulatus* n. sp.; *Centrioptera asperata* Horn; *Centri-*
optera pectoralis Blais.; *Cerenopus concolor* Lec.; *Cryptadius angu-*
latus n. sp.; *Eleodes loretensis* n. sp.; *Sibia puncticollis* Lec.;
Telabis punctulata Lec.; *Zopherodes tristis* Lec.
- Mulegé: *Eleodes vanduzeei* n. sp.; *Metoponium laticolle* Csy.
- San Nicolas Bay: *Chilometopon cribricolle* n. sp.; *Conibius opacus* Lec.;
Telaponium castaneum n. sp.

SONORA

- Guaymas: *Asidina terricola* n. var.; *Blapstinus aridus* n. sp.; *Centrioptera variolosa* Lec.; *Conibius gagates* Horn; *Edrotes mexicanus* n. sp.; *Eupsophulus castaneus* Horn; *Hylocrinus magnus* n. sp.; *Melanastus obscurus* n. sp.; *Metopoloba densiventris* Csy.; *Metoponium candidum* Csy.; *Stethasida granicollis* n. sp.; *Steriphanus alutaceus* Csy.; *Trichoderulus longipilosa* n. sp.; *Trimytis subsenilis* n. sp.; *Triorophus lævis* Lec.
- San Carlos Bay: *Argoporis labialis* n. sp.; *Argoporis alutacea* Csy.; *Centrioptera variolosa* Lec.; *Metopoloba densiventris* Csy.; *Sibia puncticollis* Lec.
- San Pedro Bay: *Argoporis alutacea* Csy.; *Blapstinus paradoxus* n. sp.; *Centrioptera sculptiventris* n. sp.; *Centrioptera variolosa* Lec.; *Conibius opacus* Lec.; *Edrotes mexicanus* n. sp.; *Eleodes inflata* Blais.; *Eusattus puncticeps* n. sp.; *Rhinandrus sublævis* Horn.
- Tepoca Bay: *Edrotes mexicanus* n. sp.; *Nocibiotes granulatus* Lec.; *Phaleria pilifera* Lec.; *Steriphanus estebani* n. sp.; *Trichoderulus longipilosus* n. sp.

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PROCEEDINGS
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XIII
EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹

THE BOMBYLIIDÆ (BEE FLIES)

BY

FRANK R. COLE

Associate Curator in Dipterology

The Diptera collection made by Mr. E. P. Van Duzee in 1921 in the region of the Gulf of California is the most extensive yet taken in that part of the country. The expedition sent out by the California Academy of Sciences collected on all of the principal islands in the Gulf and made several stations on the mainland and on the peninsula. The collecting was done during the summer and the Diptera taken consist of typical summer forms, the Bombyliidæ and Asilidæ being quite abundant. This paper will deal with the species of Bombyliidæ collected, 73 species in all, 28 of which are described as new. The writer has in view a revision of this family of the Diptera and the descriptions given here are rather brief in some cases. Coquillett published a Revision of the genus *Villa* (Anthrax) in the Trans. Am. Ent. Soc., XIX, 168-187 (1892); the table of species in his paper is referred to in the discussion of some of the species of *Villa*.

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

July 10, 1923

1. *Exoprosopa iota* Osten Sacken

A large series taken from the following localities: Angeles Bay, June 26 and 27; Espiritu Santo Island, May 31 and June 9, 17 specimens; San Francisquito Bay, May 10 and June 23; Coronados Island, May 18; Ceralbo Island, June 8; Willard's Point Bay, Tiburon Island, July 3; Guadalupe Point, Concepcion Bay, June 18; Mulegé, May 14; Las Animas Bay, May 8; Guaymas, April 7, 10, 11, and 15.

2. *Exoprosopa eremita* Osten Sacken

Agua Verde, May 25; San José Island, June 10; Tiburon Island, July 3; Puerto Refugio, Angel de la Guardia Island, June 29.

3. *Exoprosopa hyalipennis* Cole, new species

Male: Length, 10-14 mm. Face, cheeks and lower frons reddish; tomentum of face and frons yellow; pile of upper frons black; vertex and occiput black, the tomentum of occiput white. Style of antenna about one-third as long as third joint (see fig. 13). Thorax black; mesonotum yellow pilose and tomentose; scutellum largely brownish red, the base black, pile and tomentum yellowish. Knob of halteres white, the stem yellow. Pile of upper pleura yellowish white, tomentum white; pile of coxæ white. Abdomen largely red in ground-color, with a median wedge of black reaching almost to end of sixth tergite; base of third tergite (second visible)* white tomentose; posterior margins of 3, 4, 5 and 6 and median part of 4 black tomentose; yellow tomentum on base of 4 and 6; most of fifth tergite white, the seventh and eighth silvery white tomentose. Venter silvery white tomentose and white pilose. Femora and tibiæ reddish, tarsi blackened; anterior tibiæ smooth, the claws minute; tomentum of legs largely yellowish. Wings hyaline; base of wing, costal and subcostal cells yellowish; a faint cloud at base of cell Cu-1 and on r-m cross-vein.

Female: Much like the male. Tibiæ darker in the type specimen; dorsum of abdomen darker; most of sixth tergite yellowish brown tomentose, as are the seventh and eighth tergites.

Type: Male, No. 1201, and *allotype*, female, No. 1202, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, June 27 (type) and May 7, 1921, at Angeles Bay, Lower California.

Paratypes: Two males and two females, type locality, June 25-27.

*The writer considers that there is one segment lost between the abdomen and thorax; the first apparent segment is in this paper called the second, the second visible the third, etc.

This species has the general appearance of *E. doris* but the wings are not banded as in that species.

4. *Exoprosopa atripes* Cole, new species

Female: Length 11 mm. Closely allied to the preceding species. Differs in structure of antennæ, the style being about two-thirds as long as third joint (see fig. 11, p. 293); antennæ wholly black. Face brown, not projecting; pile of face and frons black, the tomentum brassy yellow. Tomentum of occiput yellowish white. Thorax dull black; scutellum reddish brown; tomentum of mesonotum a peculiar shade of brown; pile of collar and sides of mesonotum yellow. Pile of pleura and coxæ yellow. Halteres yellow. Abdomen largely black, reddish on sides near base (this specimen somewhat rubbed). Sides of second and third segments yellow pilose; a basal yellowish white band of tomentum on third tergite, the rest black; fourth segment like third, the fifth largely yellow tomentose, the sixth and seventh mixed black and yellow, the eighth white tomentose, black at tip; black pile on sides from third segment to tip. Legs black; tomentum of femora black in front, yellow posteriorly; front tibiæ without bristles, the front claws minute. Wings gray hyaline, costal, subcostal cell and base yellowish; cell R-5 open; cross-vein connecting R-2+3 and R-4 as usual.

Type: Female, No. 1203, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, June 16, 1921, at Salinas Bay, Carmen Island, Gulf of California.

5. *Exoprosopa tiburonensis* Cole, new species

Male: Length 18 mm. Face, cheeks and most of frons reddish in ground color; tomentum of face and frons dense, yellow; pile of upper half of frons black; vertex and occiput black, the latter yellow tomentose above, white below. First two joints of antennæ red, style about one-third length of third joint (see fig. 10, p. 293). Mesonotum and scutellum black, with a dense covering of reddish and yellowish brown tomentum, whitish at base of scutellum; bristles black. Pile of collar and anterior mesonotum yellow. Pile of upper pleura yellowish white, on lower pleura and coxæ white. Halteres yellow.

Abdomen reddish in ground color, pile at base yellow; third tergite with a broad basal white tomentose band, a narrow median cross band of black tomentum and a posterior yellowish brown band; fourth tergite largely yellowish brown tomentose, white on the sides, with two black marks near base; fifth tergite white tomentose with a yellowish posterior area; sixth tergite largely yellowish, with black pile posteriorly; seventh and eighth tergites silvery white. Venter silvery white tomentose and white pilose. Femora and bases of front tibiæ reddish; tomentum of femora black in front, yellow behind; front tibiæ without bristles, the front claws minute. Wings hyaline; cell R-5 closed and petiolate; costal, subcostal cell and base of wing yellowish; small gray clouds on r-m cross-vein and base of cell Cu-1.

Type: Male, No. 1204, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, July 3, 1921, at Willard's Point Bay, Tiburon Island, Gulf of California.

This species belongs to the same general group with the two preceding forms.

6. *Villa fenestratoides* Coquillett

A male and female, taken at San Pedro Bay, Sonora, July 7, 1921, answer Coquillett's description quite well. They are very near the following species described as new, but differ in the marking of the wing. The two sexes are distinguished only by an examination of the genitalia. The abdomen and thorax differ slightly from *meridionalis*. The brown of the wings is distinctly outlined and the central portion of the brown area in the female is more yellow than in male; the brown fills cell 1st A.

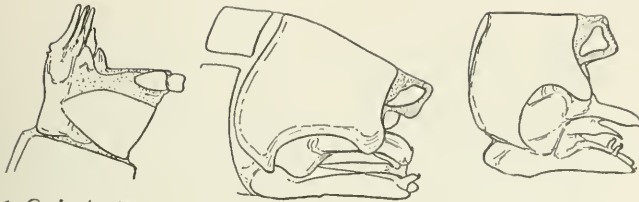
7. *Villa meridionalis* Cole, new species

Female: Length 11 mm. This species would nearly answer the description of *fenestratoides* Coquillett except that the basal half of the wings is hyaline. Face rounded, retreating, the tomentum white, pile white and yellow, reddish ground color near oral margin. Frons with yellow tomentum and black pile. Third antennal joint tapering from base (see fig. 17); the two basal joints red. Tomentum of occiput yellow at vertex, elsewhere white. Proboscis scarcely projecting. Mesonotum grayish black, brownish yellow tomentose and yellow pilose; white pile above wing bases. Scutellum largely red, black at base, with yellow tomentum and white pile. Knob of halteres yellow.

Abdomen black, with white pile at base; most of third tergite (second visible) black tomentose, yellowish white at base; fourth and fifth tergites mostly white tomentose, with posterior black borders which are wider in the middle; sixth and seventh tergites black tomentose, a few white scales on posterior margins; eighth tergite white tomentose; black pile on sides of abdomen from third segment to apex. Venter largely white tomentose, blackish on sixth and seventh sternites. Legs black, the front tibiae without bristles and the front claws minute. Wings hyaline, the costal and subcostal cells yellow.

Type: Female, No. 1205, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, June 6, 1921, on Ceralbo Island, Gulf of California.

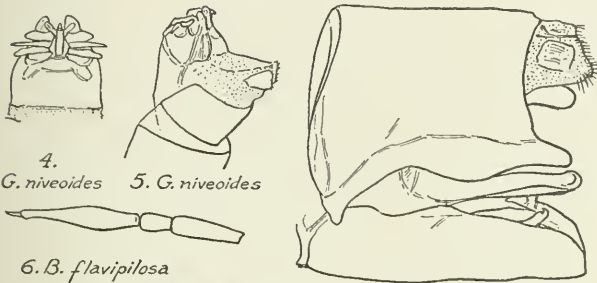
Paratypes, one female taken with the type.



1. *G. digitaria*

2. *L. hyalinipennis*

3. *V. arenicola*



4.

G. niveoides

5. *G. niveoides*

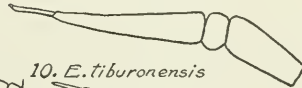
6. *B. flavipilosa*

7. *V. cinerea*

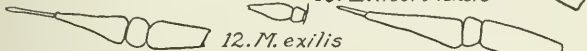


8. *G. alba*

9. *G. insularis*



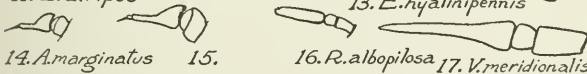
10. *E. tiburonensis*



11. *E. atripes*

12. *M. exilis*

13. *E. hyalinipennis*



14. *A. marginatus*

15.

16. *R. albopilosa*

17. *V. meridionalis*



18. *V. sini*

19. *V. cinerea*

20. *V. nitida*

In the following group of species the males have the basal half of the wings brown or blackish, but the females have the wings almost entirely hyaline. The preceding new species would be placed in the same category and therefore associated

with *V. fenestratoides* were it not for the fact that a female of that species has the basal half of the wings largely brown. More material is needed to make sure of this point. The species just described would run to *gemella* in Coquillett's table of species, published in 1892. Coquillett did not take into account the sexual differences in the wings and it is a fact that in most species the wings are the same in the two sexes, but where the wings are different there is apt to be a confusion of species.

8. *Villa arenicola* Cole, new species

Length, 4.5-6 mm. A black species with black legs and bands of black and white tomentum on the abdomen.

Male: Head black; face rounded, with dense white tomentum; tomentum of frons yellowish white, the pile black. Antennæ black, the third joint large (see fig. 29). Thorax and scutellum semishining grayish black; pile of collar and sides of mesonotum yellowish white; tomentum of mesonotum white, some with a yellowish tinge. Bristles of thorax and scutellum black; tomentum of scutellum white. Sparse pile and tomentum of pleura pure white. Halteres yellow, the knobs whitish.

Abdomen black; tomentum on posterior half of third tergite and all on sixth black, the rest of tomentum on dorsum of abdomen white, yellowish in the middle. Venter with black tomentum on the fifth and sixth sternites, the others white. Legs black; front tibiae without bristles, the front claws minute. Wings largely hyaline, basal part brown; costa with small blackish scales almost to tip of R-1; epaulets with some white scales; basal half of anal cell brown, also cell R-1, cell 2M, base of 1st M-2 and costal cell. The genitalia are shown in figure 3.

Female: Very nearly like the male. Frons slightly wider, face with more black pile. Light colored tomentum of middle part of mesonotum, scutellum and dorsum of abdomen more yellowish. Wings largely hyaline; faint cloud on small cross-vein and apex of cell R-1; costal, subcostal cell and extreme base of wing yellowish brown.

Type: Male, No. 1206, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 16, 1921, at **San Nicolas Bay, Lower California**. *Allotype*: Female, No. 1207, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 6, 1921, at Ceralbo Island, Gulf of California.

Paratypes, 9 males and 12 females from the following places: Coronados Island, May 18; Ceralbo Island, June 6; San José Island, June 1 and 10; Tepoca Bay, Sonora, April 25; Espiritu Santo Island, June 1; Tiburon Island, April 23.

9. *Villa ariditata* Cole, new species

Length 7-9 mm. A species with many iridescent scales on the body; basal half of wings blackish in male, largely hyaline in female.

Male: Closely allied to *arenicola*, but many of the scales on the body are brightly colored. Antennæ like those of preceding species (see fig. 30). Tomentum of frons and face brassy yellow. Tomentum of middle of mesonotum with a purple or brownish tinge; scutellum with tomentum whitish and with purple tinge. The large white scales on pleura have a greenish reflection, on coxæ purplish black. Light colored scales on tergites more yellow than in *arenicola*, the black scales with purple reflections. Eighth tergite white tomentose with brassy green reflections. The brown of wings more extensive than in *arenicola* (see fig. 21); costa with scales as in *arenicola*.

Female: Head, thorax and abdomen about as in male, the tomentum even brighter colored. The wings are largely hyaline as in *arenicola*, the brown spots more distinct.

Type: Male, No. 1208, and *allotype*, female, No. 1209, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, June 25, 1921, at Angeles Bay, Lower California.

Paratypes, 2 males and four females; Angeles Bay, June 26 and 27; Pond Island Bay, June 30 and July 1; San Pedro Bay, Sonora, July 7.

10. *Villa vastititas* Cole, new species

Male: Length 6 mm. Very nearly like the preceding species, but the vestiture duller colored. Tomentum of frons and face dull yellow, the scales narrow; pile black. Tomentum of occiput white. Antennæ shown in figure 31. Thorax and scutellum with black bristles; pile of thorax yellow, the tomentum brownish with a purple tinge, but the scales hair-like and not iridescent. Pile of pleura and hind coxæ white, of the four front coxæ black.

White pile at base of abdomen; anterior corners of third tergite yellow tomentose and most of the fourth and fifth; most of third and posterior margins of fourth and fifth tergites black tomentose; sixth and seventh tergites largely black tomentose, but with some yellow; eighth tergite white tomentose. Male genitalia larger than *ariditata* (not dissected out). Wings much as in *ariditata* but the brown reaches farther distad, more than half of cell 1st M covered; costa as in the preceding two species.

Type: Male, No. 1210, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, June 6, 1921, on Ceralbo Island, Gulf of California.

Only the unique male was taken. The female will undoubtedly have nearly hyaline wings as is the case with others in the group.

11. *Villa sonorensis* Cole, new species

Male: Length 4.5 mm. Closely allied to the preceding two species, frons proportionately broader; lower half of frons dense white tomentose, upper half with few yellowish scales and black pile. Upper occiput with yellow tomentum, lower part white. Third antennal joint proportionately shorter than in the preceding three species (see fig. 32). Ground color of thorax more shining black than in the preceding three species. Anterior third of mesonotum white tomentose and white pilose; rest of mesonotum largely rubbed, probably metallic yellowish as on scutellum. Knob of halteres pure white, the stem yellowish. Pleura white tomentose and pilose; coxæ with black pile.

Abdomen (more or less rubbed) with white pile at base; third and base of fourth tergite white tomentose; most of fourth and all of fifth and sixth tergites black tomentose; seventh tergite yellow tomentose, the eighth white. Genitalia evidently characteristic, but not dissected out. Legs and wings about as in *oriditata*.

Type: Male, No. 1211, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, April 7, 1921, at Guaymas, Mexico. The type an unique.

12. *Villa albicollaris* Cole, new species

Male: Length 4 mm. Resembles the above group of four species, especially *sonorensis*, the head and appendages being about the same as in that species (see fig. 33). Anterior third of mesonotum white tomentose and pilose, the rest apparently yellowish (somewhat rubbed). Pleura, coxæ and halteres as in the preceding species.

Abdomen about as in *sonorensis*, but tergite VII black tomentose, VIII yellow and white. The male genitalia apparently different from *sonorensis*, the wings proportionately narrower than in that species and entirely hyaline except for the yellow subcostal cell and faint yellow at base of wing.

Type: Male, No. 1212, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, May 29, 1921, at San José Island, Gulf of California.

13. *Villa* sp.

A small specimen taken at Tepoca Bay, Sonora, is very near *albicollaris*, but specifically distinct. The third antennal joint has a slender styliform portion. The abdomen has the

third, fourth, fifth, seventh and eighth tergites largely or wholly white tomentose.

14. *Villa crocina* Coquillett

Two males and three females were taken at Angeles Bay, April 25, 26 and June 26; one female taken at Pond Island Bay, June 30. In this brightly colored species the males have the basal part of the wings brown, the females have almost entirely hyaline wings.

15. *Villa perplexa* Coquillett

A series from Coronados Island, May 18, and one specimen taken at Agua Grande, Carmen Island, June 15, are probably this species. Two smaller specimens taken at Angeles Bay, May 7, are very near this species.

16. *Villa albicincta* Cole, new species

Male: Length 6-9.5 mm. Head and appendages black. Face and frons with brassy yellow tomentum, some with a purple tinge, the pile black. Third antennal joint gradually tapering to tip (see fig. 36). Tomentum of occiput, brassy above. Proboscis scarcely projecting. Thorax and scutellum shining black, with brassy yellow pile, much of it with a purple color in certain lights; bristles black. Pile on anterior mesonotum and upper pleura yellow, on lower pleura and coxæ black. Knob of halteres white, the stem yellowish.

Abdomen black, basal corners with white pile; anterior corners of third, part of seventh and eighth and a conspicuous band on base of fourth tergite white tomentose, the rest of abdomen with black tomentum (gives impression of a black abdomen with a median white band). Legs black, black tomentose; anterior tibiae without bristles, the anterior claws minute. Wings brown on the proximal half, the extreme base and costal cell yellowish; the brown goes beyond the middle of cell 1st M-2 and Cu-1; most of cell 1st A and 2nd A brown.

Type: Male, No. 1213, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, April 10, 1921, at **Guaymas, Mexico**.

Paratypes, 2 males from Guaymas, April 8 and 15; 1 male from San José Island, May 29, 1921.

This species would run to couplet 72 in Coquillett's table published in 1892. It is closer to *arenicola* and *ariditata*, described above, than to *lepidota*, where it would run in the Biologia table of species.

17. *Villa quadripunctata* Cole, new species

Male: Length 4.5 mm. This species has somewhat the appearance of *arenicola*, described above, and the group related to it. Head black, face and frons with sparse, dull yellow tomentum and rather coarse, black pile. Antennæ black, third joint with a long styliform portion (see fig. 34). Face rounded, proboscis not projecting; occiput white tomentose. Thorax and scutellum gray black, with black bristles; pile of anterior mesonotum yellowish white; tomentum of mesonotum fine, yellowish, with a purple tinge. Pile and tomentum on pleura white, on the coxæ black. Knob of halteres white, the stem yellowish brown.

Third tergite of abdomen with the anterior corners white tomentose, the rest black; tomentum on fourth and fifth white, with black posterior margins, on the sixth and seventh black, on the eighth white. Genitalia black, with black pile. Basal half of venter white tomentose, the rest black. Legs black, black tomentose; front tibiæ without bristles, the front claws minute. Wings brown on more than basal half, the outline of the color distinct; cell 1st A brown except tip and cell 2nd A gray brown; the brown reaches some distance beyond small cross-vein; r-m cross-vein and origin of R 2+3 bordered hyaline, also base of cell 2M-2 and Cu-1; a whitish spot in upper distal corner of cell 2M.

Type: Male, No. 1214, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, July 7, 1921, at San Pedro Bay, Sonora.

18. *Villa flavicincta* Cole, new species

Female: Length 6 mm. A black species, with wings largely hyaline. Head black, including antennæ; face conical (see fig. 23); pile of frons and face black, tomentum of face sparse, yellow and fine as is tomentum of occiput. Third joint of antennæ short-conical (see fig. 24). Thorax black, mesonotum with yellow pile anteriorly and on sides, the central portion with black tomentum and sparse black pile. Scutellum black, with yellow tomentum. Bristles of thorax mixed black and yellow, those on scutellum black. Pile on pleura yellow, on coxæ black. Knob of halteres brownish yellow, the stem brown.

Abdomen black, the first visible segment yellow pilose on sides, the other abdominal tergites yellow tomentose at base, black on the posterior half or more; black pile on the sides from the fourth segment to the tip and around the ovipositor. Venter black, black tomentose, and with black pile except a few yellow near the base. Legs black, black tomentose; front tibiæ without bristles and front claws minute. Most of wing gray hyaline, including anal angle and distal half of cell 1st M-2; costal cell, subcostal, cell R and 2M gray brown, the color reaching into base of cells Cu-1 and M-2 and slightly beyond small cross-vein.

Type: Male, No. 1215, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, April 11, 1921, at Guaymas, Mexico.

The species is clearly different from any described in the *Biologia Cent. Amer.*; it is nearest to *vana* Coquillett among the species from north of Mexico.

19. *Villa hircina* Coquillett

Two females, one from Gonzales Bay, April 29 (a rubbed specimen), the other from Lagoon Cove, Angel de la Guardia Island, May 2, 1921.

20. *Villa cinerea* Cole, new species

Length 13-14 mm. A dull colored species, with yellow and white pile and largely hyaline wings.

Male: Face and cheeks reddish brown, the rest of head black; face projecting, conical; face and frons with yellowish white tomentum and short black pile. First two antennal joints red, black pilose, the third joint black, long conical (see fig. 19). Proboscis scarcely projecting beyond oral margin. Tomentum of occiput largely white, yellowish above. Anterior part of thorax with erect yellow pile, the rest of pile of mesonotum and pleura largely white and reclinate. Median part of mesonotum with tomentum-like pile, some of which is brownish in color. Scutellum black, with white tomentum and pile. Bristles of thorax and scutellum yellow. Halteres brown, the knob white.

Abdomen largely black in ground color, posterior margin of segments reddish brown, the dorsum with a dense covering of tomentum which is mostly white, that on middle and on posterior margins of tergites three to six being brown; pile largely white, yellow on posterior margin of three to six. Genitalia brown, with erect yellow pile, its structure shown in fig. 7. Legs black, some dark reddish color on femora and tibiae, the tomentum yellow and white; front tibiae with bristles, the claws large. Wings mostly gray hyaline, basal half faintly infuscated; costal cell yellowish brown; a brown spot in bases of cells Cu-1 and M-3, on the r-m cross-vein and at base of vein R-2+3.

Female: Very nearly the same as the male. Ovipositor with a ray-like circlet of yellow spines, with erect black pile.

Type: Male, No. 1216, and *allotype*, No. 1217, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, May 7 (type) and May 10, 1921, at Angeles Bay, Lower California.

Paratypes, several specimens taken with the types at Angeles Bay and specimens from Las Animas, May 8 and San Francisco Bay, May 10. In Coquillett's table this species would run to the couplet with *perplexa* and *edititia*.

21. *Villa mercedis* Coquillett

One female, taken at Tiburon Island, April 23. It fits the description very well except that the mesonotum is largely yellowish tomentose and the venter in large part black in ground color.

22. *Villa vana* Coquillett

Freshwater Bay, Tiburon Island, April 23; Tepoca Bay, April 25; Angeles Bay, May 7. Five specimens in all.

23. *Villa squamigera* Coquillett

One specimen from each of the following localities: Lagoon Cove, Angel de la Guardia Island, May 2; San Francisquito Bay, May 10; Monserrate Island, June 15; Guaymas April 8.

24. *Villa lepidota* Osten Sacken

A series of 35 specimens, mostly from the first three localities given. Tortuga Island, May 11; Ceralbo Island, June 6; San Pedro Nolasco Island, April 17; San Francisquito Bay, May 10; Angeles Bay, May 7, June 26; Coronados Island, May 18; Espiritu Santo Island, June 9.

25. *Villa syrtis* Coquillett

Guaymas, April 8; Angeles Bay, May 7; San Francisquito Bay, May 10.

26. *Villa mira* Coquillett

Angeles Bay, June 26; Escondido Bay, June 14; San José Island, May 28; Coyote Cove, Concepcion Bay, June 18.

27. *Villa sabulosa* Coquillett

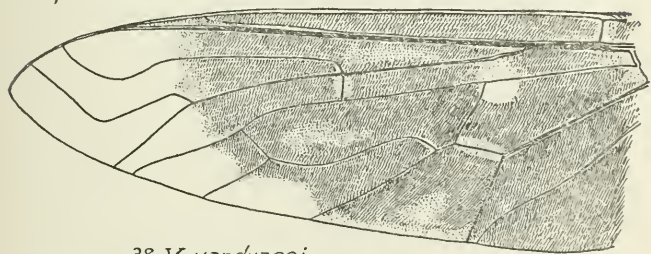
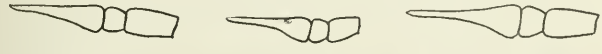
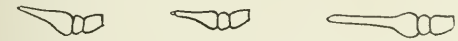
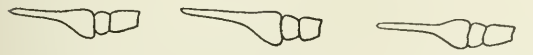
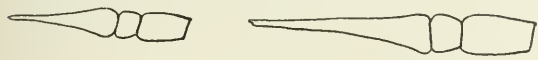
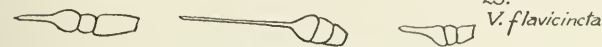
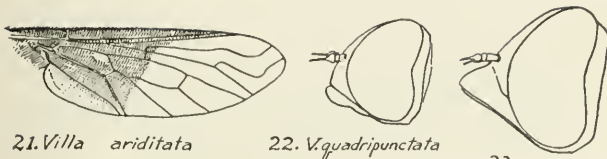
Loreto, May 20; Mulegé, May 14; Guaymas, April 11.

28. *Villa arenosa* Coquillett

Guaymas, April 8, 10; Agua Verde, May 26.

29. *Villa astarte* Wiedemann

This species belongs to Osten Sacken's subgenus *Chrysanthrax*. The single specimen taken is from Angeles Bay, May 6. This specimen has the third joint gone from both an-



tennae. It answers the description of *astarte* given by Williston in the *Biologia*. The mesonotum is shining black, not velvety as in *V. fulvohirta*, and the wings are yellowish brown at base.

30. *Villa* sp.

A female specimen taken at Tepoca Bay, April 25, cannot be placed with certainty. In Coquillett's table of species it would run to *scitula* Coquillett, but there is no yellow tomentum on the face and the thorax is yellowish brown tomentose, not coppery as in *scitula*.

31. *Villa lateralis* Say

Tepoca Bay, April 25, nine specimens; Angeles Bay, May 7; Freshwater Bay, Tiburon Island, April 23; Las Animas Bay, May 8.

32. *Villa molitor* Loew

Several specimens, mostly from Isla Raza, April 21; Espiritu Santo, June 1; Coyote Cove, Concepcion Bay, June 18; Tepoca Bay, April 25; San Francisquito Bay, May 30. Several specimens from Tepoca Bay, April 21 and 25, are slightly different and may prove to be a variety.

33. *Villa nivea* Cole, new species

Length 4.25-5 mm. A small black species, with no black pile on the abdomen and entirely hyaline wings.

Male: The specimen is somewhat rubbed. Head black, oral margin brown; face rounded, with white tomentum and pile; frons white tomentose and pilose, a few black pile on the vertex. Occiput white tomentose. Proboscis not projecting. Antennæ short, black (see fig. 26). Thorax and scutellum black, with white pile and bristles; tomentum on anterior part of mesonotum white, on the median part yellowish. Pleura and coxæ white tomentose and pilose. Halteres yellow.

Abdomen somewhat greased so that most of the dorsum appears to be black tomentose, that on the base white. All pile of abdomen white. Pile of venter white, some of the tomentum black. Legs largely black, the tomentum and pile white; bases of tibiæ yellow; front tibiæ without bristles, the front claws minute. Wings hyaline.

Female: Differs from the male in having tomentum of frons dark yellowish except on the lower corners. Thorax and scutellum as in the male. Abdomen black, all of pile and most of tomentum white; a spot of black tomentum in middle of third tergite, with some yellow around it; a much wider band on fourth tergite; most all of fifth black; sixth and seventh tergites with some yellowish tomentum. The fifth, sixth and seventh tergites with very long white bristles, heavier than the ordinary pile; blackish tomentum in middle of tergites three to eight.

Type: Male, No. 1218, and *allotype*, female, No. 1219, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, May 16, 1921, at **San Nicolas Bay, Gulf of California**.

This species seems to be distinct from any described from the United States; in Osten Sacken's table of Hyalanthrax in the *Biologia* all of the species have black tufts of pile along the sides of the abdomen.

34. *Villa sini* Cole, new species

Length 8-10 mm. A blackish species, white and black tomentose with hyaline wings.

Male: Head black, the face and frons dense white tomentose, with some short white pile; some black pile on vertex. Occiput white tomentose. Proboscis not projecting beyond oral margin. Antennæ (see fig. 18) black, with black pile. Mesonotum dull black, tomentum on anterior half white; tomentum on posterior portion and on scutellum yellowish, gray or brownish. Bristles of thorax mixed yellow and black, of scutellum black. Pile and tomentum of pleura whitish. Knob of halteres white, the stem pale brown.

Abdomen dull black; third tergite with black tomentum at base, that on fourth and fifth largely black or brownish black, the rest of tomentum of abdomen white. Pile at base of abdomen white, on the fourth, fifth and sixth black, on the eighth white. Base of venter white tomentose, beyond the third segment black. Genitalia reddish brown, with yellow pile. Legs black, with black tomentum; front tibiæ without bristles, the front claws small. Wings hyaline, the costal and subcostal cells and base of wing yellowish.

Female: Very nearly like the male. Frons distinctly broader and largely golden yellow tomentose, varying to dull yellow as on the upper occiput. Mesonotum except anterior portion, and the scutellum golden brown tomentose. Middle of third tergite, base of fourth and fifth, all of sixth and seventh golden brown tomentose, the rest of abdominal tomentum white.

Type: Male, No. 1220, and *allotype*, female, No. 1221, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, June 30 (type) and July 3, 1921, at **Pond Island Bay, Angel de la Guardia Island, Gulf of California**.

Paratypes, one male from Pond Island Bay; nine females from Tiburon Island, July 3; one female, San Francisquito Bay, June 23; three females, Angeles Bay, May 7.

35. *Villa flavipilosa* Cole, new species

Length 9.5-11.5 mm. A yellow pilose and tomentose species with hyaline wings.

Male: Most of head black, the face and lower frons reddish; face very conical, with bright yellow tomentum; frons yellow tomentose, sparse above and with black pile on upper half. Occiput largely yellow tomentose, some white on sides. First two antennal joints red, the third black, long conical at base (see fig. 27). Proboscis not projecting. Thorax and scutellum black, very fine yellow tomentose (not scales) and yellow pilose. Pleura and coxæ yellow pilose, paler below base of wings. Halteres yellow.

Sides of abdomen and the venter reddish in ground color, the median portion of dorsum black; dorsum with dense even covering of yellow, hair-like tomentum, the base, sides and tip with short bushy yellow pile. Posterior margins of third, fourth and fifth tergites with some black tomentum in middle. Coxæ, femora and tibiæ reddish; the tomentum of legs yellow; front tibiæ bristly, the claws of front tarsi almost as large as on others. Wings hyaline, the costal and subcostal cells and base of wing yellowish.

Female: In general appearance the same as the male; the frons slightly broader.

Type: Male, No. 1222, and *allotype*, female, No. 1223, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, June 16 (type) and May 26, 1921, on San José Island, Gulf of California, and May Verde, Lower California.

This species would run to *mercedis* in Coquillett's table of species. It differs from that species in the larger front claws and the different color of the vestiture. It differs from the species in the *Biologia* in the subgenus *Hyalanthrax* in lacking black pile on the sides of the abdomen.

36. *Villa peninsularis* Cole, new species

Male: Length 10.5-11.5 mm. Face reddish yellow in ground color, pile and tomentum yellowish white; tomentum of frons yellowish white, the pile black. First two antennal joints red, the third black, long conical (see fig. 35). Tomentum of occiput yellowish. Thorax and scutellum grayish black; pile of anterior mesonotum yellowish, as is the hair-like tomentum; bristles yellow, some black on margin of scutellum. Pile and tomentum of pleura white, on the coxæ partly yellow. Halteres yellow.

Abdomen largely reddish in ground color, a median triangle on dorsum, broad at base and ending in a narrow point on the sixth tergite; tomentum largely yellowish white, narrowly brown on posterior margin of three, four and five, wholly brown on the sixth. Some black pile on sides of fourth, fifth and sixth segments, the rest white. Genitalia reddish, with yellow pile. Legs black, the tomentum largely black, yellowish on the hind side; front tibiæ without bristles, the front claws minute. Wings hyaline, subcostal cell, base of wing and r-m cross-vein with yellow color. Epaulets yellow-tomentose.

Female: Nearly the same as male. Tomentum of mesonotum, scutellum and wing base darker, golden yellow. More black pile on apical part of abdomen.

Type: Male, No. 1224, and *allotype*, female, No. 1225, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, June 25, 1921, at Angeles Bay, Lower California.

37. *Villa nitida* Cole, new species

Female: Length 5-6 mm. A black species, largely shining in ground color. Head black, face slightly rounded, not conical; face and frons sparse yellow tomentose and black pilose. Occiput whitish tomentose. Antennae black, the styliform portion of third joint not marked off distinctly (see fig. 20). Proboscis scarcely projecting beyond oral margin. Thorax and scutellum shining black; mesonotum with yellowish white tomentum; pile of collar yellowish white; bristles of thorax and scutellum black. Pleura, pectus and coxæ black pilose. Halteres yellow, the knob pale brownish. A tuft of reddish gold pile before the halteres.

Abdomen largely shining black, anterior corners dull reddish; conspicuous tufts of golden red pile on sides of first two segments; some black pile on sides of third segment and from there on to tip of abdomen. Tomentum of abdomen largely black, with a yellowish tinge on base of third tergite; basal half of fourth tergite white tomentose except in middle; last two segments brassy tomentose above. Venter black, with black tomentum and pile. Legs black, black-tomentose; front tibiae without bristles, the front claws minute. Wings hyaline, base and subcostal cell hyaline.

Type: Female, No. 1226, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, April 25, 1921, at Tepoca Bay, Sonora.

Paratypes, fifteen females taken at Tepoca Bay with types; two females from Angeles Bay, May 7. This species would run to *gemella* or *lateralis* in Coquillett's table of species. It is not nearly related to any of the species described in the Biologia.

38. *Villa effrena* Coquillett

Three specimens taken. Espiritu Santo, May 31; Ceralbo Island, June 8; Tiburon Island, south end, July 5.

39. *Villa miscella* Coquillett

Three specimens from Espiritu Santo, June 1; one specimen from San Evaristo Ranch, Lower California, June 10.

40. *Villa vanduzeei* Cole, new species

Male: Length 20 mm. Length of wing 18.5 mm. Most of the head black, face and lower half of frons red; tomentum and pile of face reddish yellow; tomentum of frons reddish yellow, the pile black. First two antennal joints red, the third black and gradually tapering from base (see fig. 28). Face rounded, the proboscis scarcely projecting. Occiput with golden tomentum. Thorax black, with reddish yellow pile anteriorly and on the margins, the tomentum of the same color and hair-like (not in scales); most of the disk of mesonotum short black pilose. Scutellum except base dark red, with black pile and bristles and yellow tomentum. Pleura and coxæ golden red pilose.

Ground color of abdomen red except a median portion which is black; the black portion widens on posterior margins of third, fourth and fifth tergites. Tomentum of abdomen largely reddish as on thorax, black on the black portion, across the posterior margins of the fifth and seventh tergites and all of sixth. Legs almost wholly black, the middle femora reddish below; tomentum of femora black behind, reddish yellow in front; front tibiae without bristles, the front claws small. Wings largely blackish brown, the base and costal cell yellowish; apex and posterior margin of wing to end of anal cell hyaline; middle of cell 1st M-2 and 1st A gray hyaline; a hyaline spot in upper distal corner of cell 2M; r-m cross-vein and base of cell Cu-1 bordered yellowish.

Female: Nearly the same as male but the frons is slightly wider. The genitalia alone will distinguish with certainty.

Type: Male, No. 1227, and *allotype*, female, No. 1228, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, July 7, 1921, at San Pedro Bay, Sonora.

Paratypes, one male, taken with the types. This species resembles *V. miscella* Coquillett, but a number of characters separate it from that species. It is one of the largest and finest species known to North America. The writer takes great pleasure in naming this species for Mr. E. P. Van Duzee, who made such a fine collection of Bombyliidae in the Gulf region.

41. *Lepidanthrax angulus* Osten Sacken

Two female specimens were taken, one in Palm Cañon, Angel de la Guardia Island, May 3, the other (badly rubbed) on Tortuga Island, May 11. The first specimen has only a trace of a spot in the wing at the end of vein R2+3 and none at the end of R-1.

42. *Lepidanthrax proboscidea* Loew

A total of nine specimens taken. San Francisquito Bay, May 10; San Esteban Island, April 19; San Pedro Nolasco Island, April 17.

43. *Lepidanthrax hyalinipennis* Cole, new species

Length 3.75 to 10 mm.

Male: Differs from *inauratus* in having the tomentum of occiput white, second joint of antennæ partly black and coxæ black instead of reddish. Bushy yellow pile at base of abdomen; third tergite white tomentose at base, brownish yellow across middle, black on the posterior margin; tergites four, five and six with dense, appressed silvery white scales; posterior margin of these segments yellow, the sides with black scales; last segment yellow tomentose. Segments four, five, six and seven red in ground color. Antenna shown in fig. 25, the genitalia in fig. 2. Tarsi all blackish and tips of tibiæ darkened. Halteres yellow. Wings hyaline, with no spots, the subcostal cell yellowish.

Female: Nearly the same as male. No silvery scales on abdomen. Fourth abdominal tergite with a white tomentose band at base, yellow posteriorly; fifth tergite largely black, golden yellow posteriorly; the remainder of abdomen pale yellow tomentose; sides of segment four to the tip of abdomen with black scales. Venter yellowish white tomentose, some black near tip.

Type: Male, No. 1229, and *allotype*, female, No. 1230, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, May 31, (type) and June 9, 1921, on **Espiritu Santo Island, Gulf of California.**

A long series taken from the following localities: Espiritu Santo Island, May 31, June 9; Monserrate Island, June 13; Angeles Bay, May 7, June 26, 27; Tiburon Island, April 23; Ceralbo Island, June 6; San Francisquito Bay, June 23; Concepcion Bay, June 18; San José Island, May 28.

A series of 13 males and 12 females from Tiburon Island seem to be a color variety; tergites four and five of abdomen often largely black and venter darker. More black scales on sides and apex of abdomen. There is some variation in length of proboscis, but in this series the length will average shorter than in the typical form.

44. *Spogostylum pluto* Wiedemann

Guaymas, April 11; Guadalupe Point, Concepcion Bay, June 18.

45. *Spogostylum œdipus* Fabricius

Escondido Bay, June 14; Danzante Island, May 24; San Francisquito Bay, June 23; Guaymas, April 11.

46. *Spogostylum simson* Fabricius

Ceralbo Island, June 8; La Paz, June 3; San José Island, May 29.

47. *Bombylius flavipilosa* Cole, new species

Female: Length 6 mm. Black, largely yellow pilose. The proboscis about as long as thorax. Antennæ black, first two joints with yellow pile, third joint widest near middle (see fig. 6). Face black, with golden yellow pile, some black intermixed; frons with recumbent yellow tomentum and mixed black and yellow pile. Pile of mesonotum, pleura, pectus, dorsum of abdomen and venter almost wholly yellow, a few long black hairs on posterior part of mesonotum and on posterior margins of abdominal segments. Legs yellow, a black spot in front of knees, the last two tarsal joints and apex of third blackish; tomentum of femora yellow. Wings grayish hyaline, indistinctly infuscated at base and in costal cell; stigma yellow; vein closing cell 1st M-2 distally very short.

Type: Female, No. 1231, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 10, 1921, at San Francisquito Bay, Lower California.

There is one female paratype, taken with the type. The species is near *cachimans* but is smaller and has a shorter proboscis. In *B. io* Will. the antennæ are yellow at the base and longer than distance from vertex to oral margin, instead of the same length as in the above species. *B. clio* Will. is nearer, but the pile of the face is black. *B. albopenicillatus* has long black pile on the face and the abdomen is largely black pilose. *B. dolorosus* has no yellow pile on the face or abdomen.

48. *Heterostylum robustum* Osten Sacken

La Paz, June 3, 4 and 5, where most of the specimens were taken; Loreto, May 20; San Francisquito Bay, June 23;

Agua Verde, May 26; San José Island, June 10; Pond Island Bay, Angel de la Guardia Island, June 30.

49. *Lordotus apicula* Coquillett

Guaymas, April 8; San Pedro Nolasco Island, April 17.

50. *Lordotus junceus* Coquillett

Tepoca Bay, April 25, where most of the specimens were taken; San Francisquito Bay, May 10. One male and one female are almost wholly white pilose. The first antennal joint is about one-half as long as third. There is some variation in the length of the proboscis and in the males it is longer than in the females.

51. *Aphæbantus mus* Osten Sacken

Guaymas, April 7, 13 and 15; Puerto Refugio, Angel de la Guardia Island, June 29.

52. *Aphæbantus tardus* Coquillett

Tepoca Bay, April 25.

53. *Aphæbantus cervinus* Loew

Tepoca Bay, April 25; San Francisquito Bay, May 10.

54. *Aphæbantus pavidus* Coquillett

Tepoca Bay, April 25.

55. *Aphæbantus vulpecula* Coquillett

Angeles Bay, May 7.

56. *Aphæbantus pellucidus* Coquillett

La Paz, June 3.

57. *Aphæbantus desertus* Coquillett

Tepoca Bay, April 25.

58. *Aphæbantus carbonarius* Osten Sacken

A female specimen taken at San Francisquito Bay, June 23, is placed here. The styliform portion of the third antennal joint is about twice as long as the basal portion.

59. *Aphæbantus argentifrons* Cole, new species

Male: Length 6 mm. Ground color of body black. Antennæ black, styliform portion of third joint about equal to basal portion (see fig. 15). Frontal orbits and upper occipital orbits silvery. Frons and face whitish gray pollinose and white pilose. Lower occiput white tomentose. Proboscis scarcely projecting beyond oral margin. Thorax and scutellum gray pollinose and white pilose; the sparse tomentum on disk of scutellum yellowish. Knob of halteres bright yellow.

Abdomen gray pollinose and sparse white pilose; tomentum sparse and largely white; a spot of black tomentum in middle of tergites three to seven. Hypopygium about as long as sixth and seventh segments combined, gray pollinose, with white tomentum and pile. Only hind pair of legs present; basal three-fourths of tibiæ and base of first tarsal joint yellowish, the rest of legs black; sparse pale hairs below on femora. Wings hyaline, the stigma yellow.

Type: Male, No. 1232, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, June 1, 1921, on **Espiritu Santo Island, Gulf of California.**

The type is an unique. The species runs to *vulpecula* in Coquillett's table of species (1894), but is evidently nearer *catulus*, differing from that species in the shape of the third antennal joint, in having the scutellum gray pollinose, etc.

60. *Aphæbantus marginatus* Cole, new species

Female: Length 4.5 mm. Black, largely shining or subshining. Pile of frons largely yellow, that on face and around antennæ white. Styliform portion of third antennal joint scarcely longer than basal portion (see fig. 14). Most of frons subshining, gray pollinose on sides; face gray pollinose. Thorax subshining, yellow tomentose and white pilose; bristles yellow. Scutellum shining black, some yellow scales at base and long yellow bristles on margin. Halteres pale yellow.

Abdomen black, subshining; a large part of the tergites black tomentose, the posterior margins white and between these colors with sparse golden yellow scales. Venter white tomentose. Pile of abdomen white, very sparse. Most of tibiæ and base of first tarsal joint reddish, the rest of legs black; a few fine white bristles below on hind femora. Wings hyaline.

Type: Female, No. 1233, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, April 23, 1921, on Tiburon Island, Gulf of California.

The type is an unique, but it is a well marked species. It would run to *vulpecula* Coq. in Coquillett's table of species (1894), but the marking of the abdomen is quite different.

61. *Aphæbantus* sp.

One specimen, a male, taken at Loreto, May 20, is undoubtedly undescribed, but the antennæ are broken. The abdomen has a longitudinal row of black tomentose spots which are bordered on the sides by brown tomentum; the narrow posterior margin of the tergites is white tomentose. There is a flat tuft of silvery pile over the hypopygium. The halteres are yellow and the wings hyaline.

62. *Aphæbantus* sp.

An unique female taken at San Francisquito Bay, May 10. The species is near *vulpecula*, but is probably undescribed.

63. *Metacosmus exilis* Coquillett

One female, taken at Escondido Bay, Lower California, June 14. The head is somewhat greased and the pruinose areas cannot be made out clearly. The antennæ are black and very short (see fig. 12), the first joint scarcely visible. The knob of the halteres and middle of the stem white.

64. *Geron nivea* Cresson

The specimens are placed here, but may prove to be a distinct species. The length is 4-6.5 mm. The frons is silvery white tomentose. The dorsum of the abdomen is velvety black, with sparse golden tomentum on the median portion, the sides and venter gray pollinose and silvery white tomentose. All of the abdominal pile is white. The genitalia are near those figured for *nivoides* new species. The front tibiæ are black. A male and female were taken at Guaymas, April 13 and 15; three males from San Esteban Island, April 19, Angeles Bay, June 25 and Pond Island Bay, June 30.

65. *Geron digitaria* Cresson

In the Proc. of the Acad. of Nat. Sciences of Philadelphia, Nov. 1919, pages 183-185, Cresson gives some notes on the species of the genus *Geron* and he is the first dipterist to use the form of the male genitalia in separating the species. In this genus the wing venation offers very few characters for differentiation of species. The color of the vestiture is of value in perfect specimens. There are two types of male genitalia, one of the type of *digitaria* (see fig. 1) and the other of the type of *niveoides* as shown in fig. 4. A series of nine males and nine females are determined as this species, from the following localities: Guaymas, April 10; Concepcion Bay, June 17; Angeles Bay, May 7 and June 26; Isla Raza, April 21; San Nicolas Bay, May 16; San Esteban, April 19; Tiburon Island, April 23 and July 3; Puerto Refugio, Angel de la Guardia Island, June 29; San Francisquito Bay, May 10; Monserrate Island, June 15; Agua Grande, Carmen Island, June 15; La Paz, June 3.

66. *Geron niveoides* Cole, new species

Male: Length 5-6 mm. Nearly like *nivea* Cresson. The proboscis is slightly longer. The mesonotum more dull black than velvety; no golden tomentum on mesonotum, scutellum and abdomen, in its place is white, hair-like tomentum on the mesonotum and scutellum and silvery lanuginose vesture on the abdomen, dense on the incisures. Pile of scutellum and abdomen longer and more abundant than in *nivea*. The genitalia are specifically distinct from *nivea* (see fig. 4 and 5). The stigmal region of the wing is yellow.

Type: Male, No. 1234, and *allotype*, No. 1235, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, June 10, 1921, on San José Island, Gulf of California.

Paratypes, 4 males and 9 females, as follows: San Francisco Island, May 30; San Francisquito Bay, June 23; Coronados Island, May 18; San José Island, May 29 and June 10; Gonzales Bay, April 29.

A male and female from Isla Raza, April 21, may belong here, although the male genitalia seem to differ slightly.

67. *Geron alba* Cole, new species

Male: Length 4-5 mm. Very nearly allied to *G. digitaria*. The pile of the whole body is white and a little longer and more abundant than in *digitaria*, the tomentum wholly white or silvery. Dorsum of abdomen not showing velvety, the gray of sides more extended. The finger-like projections on lower side of genitalia are much shorter and of a different shape than in *digitaria* (see fig. 8). The figure was made from a pinned specimen, that of *digitaria* from a specimen boiled in KOH and dissected.

Type: Male, No. 1236, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, May 18, 1921, on **Coronados Island, Gulf of California**.

Paratypes, 5 males, as follows: San Francisco Island, May 30; San José Island, May 29; Angeles Bay, June 27.

68. *Geron insularis* Cole, new species

Male: Length 4 mm. A species closely allied to *nivea* and *niveoides*, but the male genitalia are specifically different (see fig. 9). The abdomen is wholly silvery gray tomentose. The unique type has the four hind legs broken.

Type: Male, No. 1302, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, April 23, 1921, on **Tiburon Island, Gulf of California**.

69. *Rhabdopselaphus albopilosus* Cole, new species

Male: Length 3.75 mm. A black, gray pollinose species, white pilose. Antennae black, the third joint almost twice as long as the first two combined and slightly tapering from the base (see fig. 16). Face with dense silvery white pile. Occiput gray pollinose and white pilose. Proboscis about three times the length of the head.

Thorax gray pollinose, with two median black vitre and two broad lateral spots. Posterior margins of abdominal segments narrowly yellow; all the abdomen gray pollinose. Genitalia yellowish red. Knob of halteres white. Tips of femora and basal half of four hind tibiae yellowish. Wing with vein closing cell 1st M-2 straight; r-m cross-vein distinctly before middle of cell 1st M-2.

Type: Male, No. 1237, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, June 23, 1921, at **San Francisquito Bay, Lower California**.

This species is related to *fasciola* Coq.

70. *Rhabdopselaphus pygmaeus* Cole, new species

Male: Length 1.25 mm. A very small species related to *obscura* Cresson. Portion of eyes with large facets occupying three-fourths of eye. Frontal triangle and face silvery pollinose; a few short white pile on face; ocellar tubercle gray pollinose. First antennal joint smaller than second, the third twice as long as the first two combined. Proboscis twice the length of the head. Mesonotum, scutellum and pleura dense silvery gray pollinose, almost bare of vestiture, the sparse, short pile white. Halteres white.

Abdomen black in ground color, dense gray pollinose, the sparse pile short and white. Legs largely black; knees, bases of tibiae and bases of metatarsi yellowish. Femora gray pollinose. Wings hyaline. The specimen has only one wing and this has no cross-vein connecting the branches of media (cell 1st A open distally).

Type: Male, No. 1238, Mus. Calif. Acad. of Sci., collected by E. P. Van Duzee, May 10, 1921, at **San Francisquito Bay, Lower California.**

An undescribed species in the writer's collection from San Diego, California, has the same type of wing.

71. *Toxophora maxima* Coquillett

Three females were taken. Angeles Bay, May 7 and June 27, 1921; Freshwater Bay, Tiburon Island, April 23. Coquillett must have made an error in giving the length as 16 mm.; these specimens answer the description well but would measure less than 10 mm. if they were straightened out. Coquillett does not mention the black tomentum on median portion of mesonotum, disk of scutellum, a large part of third segment and base of fourth (second and third visible segments) of abdomen.

72. *Toxophora virgata* Osten Sacken

Las Animas Bay, May 8; Angeles Bay, June 26; La Paz, June 4; Coyote Cove, Concepcion Bay, June 18; Guaymas, April 11.

73. *Toxophora pellucida* Coquillett

One specimen, Mulegé, May 14.



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XIV
EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹

SOME COCCIDÆ FROM ABOUT THE
GULF OF CALIFORNIA

BY
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The material upon which this paper is based was obtained by E. P. Van Duzee, J. C. Chamberlin and I. M. Johnston, members of the California Academy of Sciences Expedition to the islands in the Gulf of California in the spring of 1921. Acknowledgments are due to Dr. Barton Warren Evermann, by whom the material was turned over to the present writers, and to the others who aided in its collection.

The collection is small but is nevertheless interesting, for practically nothing has been known of the scale insect fauna of the islands of the Gulf. Two species have been described from Carmen Island (which unfortunately are not included in the present lot), this being the extent of our knowledge. As was to be expected, the fauna proves to be identical with that of southwestern United States and the peninsula of

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

July 10, 1923

Lower California, all of the species herein listed, excepting only *Lecaniodiaspis tapiriræ* n. sp. and the unidentified species of Lecanium, having been recorded by the senior author in an earlier paper¹ dealing with the Coccidæ of the Peninsula.

Material of all the species recorded, including the type of *Lecaniodiaspis tapiriræ*, n. sp., is deposited in the collection of the California Academy of Sciences. Paratypes of the new species and material of the others have been donated by the Academy to the Stanford Collection of Coccidæ.

1. *Steatococcus morrilli* (Ckll.)

From *Lysiloma* sp., ("palo blanco"), Carmen Island.

2. *Puto yuccæ* (Coq.)

From *Sebastiana bilocularis*, at Loreto on the peninsula of Lower California, *Euphorbia* sp. on Ceralbo Island, and an undetermined shrub on Carmen Island.

3. *Lecaniodiaspis tapiriræ* Ferris & Kelly, new species

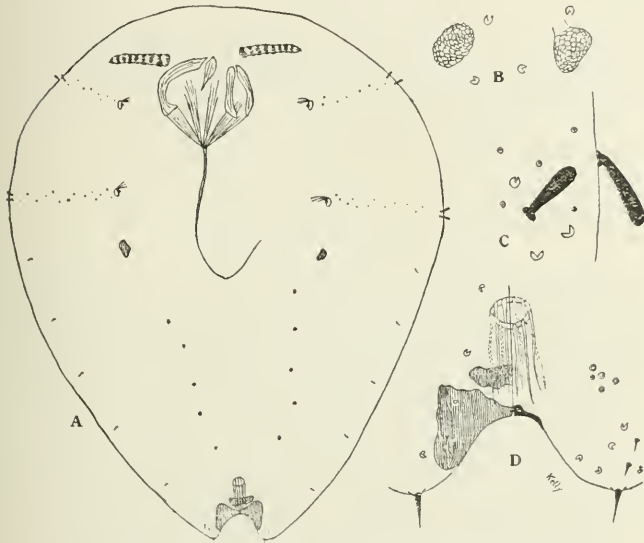
Type host and locality. From *Tapirira edulis*, ("ciruela"), on Ceralbo Island. *Habit.* Test of adult female oval, about two mm. long, the surface smooth, yellowish brown, and with a very small amount of secretion. Test of the male of the type common to the genus.

Morphological characters. Adult female. (Fig. A), about 1.8 mm. long, broadly oval, the derm membranous and bearing numbers of small, 8-shaped pores. Margins with a pair of quite large, clavate setæ (Fig. C) opposite each spiracle and with a few very small, inconspicuous setæ along the abdomen. Antennæ well developed, nine-segmented. Legs absent except for a pair of small, shapeless plates behind the posterior spiracles which represent the posterior pair. Dorsum of the abdomen with four or sometimes five pairs of cribriform plates, these very small, rather irregular in form, and borne upon short pedicels (Fig. B). Anal region of the type common to the genus, the chitinized areas arranged as shown in Fig. D.

¹ Ferris, G. F. Report upon a Collection of Coccidæ from Lower California, Stanford University Publications, Biological Sciences, 1: 2; 61-132. (1921).

Notes. An examination of all the material of this genus that is available indicates that specific differences are very poorly marked. The species here described differs from any examined, including *rufescens* from southwestern United States and *manihotis* from Mexico, chiefly in the very small, irregular and pedicellate cribriform plates.

Type: Female, No. 1239, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 7, 1921, on Ceralbo Island, Gulf of California.



Lecaniodiaspis tapiræ n. sp.: A, adult female; B, pair of cribriform plates; C, stigmatic setæ; D, anal region, left half dorsal, right half ventral.

4. *Lichtensia lycii* (Ckll.)

From *Hibiscus denudatus* on Carmen Island.

5. *Toumeyella mirabilis* (Ckll.)

From *Prosopis* sp. ("mesquite") on Carmen Island.

6. *Lecanium* sp.

A species of *Lecanium* (or possibly *Saissetia*) from *Forchammeria watsoni* ("Palo San Juan") on Espiritu Santo Island, is represented only by such a small quantity of unsatisfactory material that it is hardly identifiable or in condition to describe, if new. The structure of the derm is very much as in *Saissetia hemisphaerica* but it is hardly that species.

7. *Diaspis echinocacti* (Bouchè)

From *Cercus gummosus* and *C. schotti* on Carmen Island, *Cereus* sp. on San José Island and *Opuntia cholla* on the peninsula of Lower California.

8. *Xerophilaspis prosopidis* (Ckll.)

From *Prosopis* sp., ("mesquite"), on Carmen Island.

9. *Pseudodiaspis yuccæ* (Ckll.)

From *Forchammeria watsoni* ("Palo San Juan") on Espiritu Santo Island.

10. *Pseudodiaspis prosopidis* (Ferris)

From *Prosopis* sp. ("mesquite") on Carmen Island.

11. *Lepidosaphes peninsularis* (Ferris)

From *Porophyllum confertum* on Ceralbo Island. *Euphorbia* sp. on San Diego Island and *Asclepias subulata* on the sandspit opposite La Paz, on the peninsula of Lower California.

12. *Chrysomphalus adonidum* (Lin.)

From cultivated fig at Loreto on the peninsula of Lower California.

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XV

**EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹**

THE DERMAPTERA AND ORTHOPTERA

BY

MORGAN HEBARD

Philadelphia, Pa.

The Dermaptera and Orthoptera secured on the California Academy of Sciences' 1921 Expedition to the Gulf of California are recorded in the present paper. To these records have been added the few unpublished which are available since the appearance of the *Biologia Centrali-Americana*, 1893 to 1908. All of the material was collected by Mr. E. P. Van Duzee and in the year 1921, unless otherwise stated. This belongs to the California Academy of Sciences, the few exceptions being so specified. The author has been permitted to retain a second set.

The expedition covered a period preceding that of the appearance in greatest adult number of the Orthoptera. Though the region is undoubtedly not rich in this order; that fact largely explains why a somewhat larger number of species was not secured.

A total of 329 specimens was taken, distributed as follows:

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

July 21, 1923

MEASUREMENTS (IN MILLIMETERS)

	Genera	Species	New Species	Species known from the United States	Species peculiar to the regions about the Gulf of California
Dermoptera	2	2	0	2	0
Orthoptera					
Blattidae	5	6	0	3	2
Mantidae	1	1	0	1	0
Phasmidae	1	1	0	1	0
Acrididae	14	15	1	11	4
Tettigoniidae	5	5	3	1	3
Gryllidae	5	5	0	4	1
	—	—	—	—	—
	33	35	4	23	10

We take the present opportunity to express our hearty thanks to Mr. E. P. Van Duzee and Dr. Barton Warren Evermann for the privilege of studying this collection, secured largely at exceptionally inaccessible and little known localities.

DERMAPTERA

1. *Euborellia annulipes* (Lucas)

Mulegé, Lower California, May 14, 1921, 1 ♀.

This is one of the rare individuals of the species in which neither antennæ nor limbs are annulate. In proportions and all structural characters it agrees fully with typical individuals before us from the state of Sinaloa.

The insect has a wide, though apparently discontinuous distribution through warmer temperate and tropical North America. It has probably been introduced by commerce at many localities where it is now established.

2. *Spongovostox apicedentatus* (Caudell)

Patos Island, Sonora, Gulf of California, April 23, 1921, 1 ♂, 2 ♀; Guaymas, Sonora, Mexico, April 14, 1921, (J. C. Chamberlin), 2 ♂, 1 ♀. Mejia Island, Gulf of California, April 30, (J. C. Chamberlin), 3 ♂. Angeles Bay, Lower California, June 27, (J. C. Chamberlin), 2 ♀. Isla Partida, Gulf of California, April 22, 1 ♂, 4 ♀, 4 juv.: Tortuga Island, Gulf of California, May 11 (J. C. Chamberlin), 1 ♀. Puerto

Ballandra, Carmen Island, Gulf of California, May 21, 5 ♀. Monserrate Island, Gulf of California, May 25, 1 juv. Santa Catalina Island, Gulf of California, June 12, (J. C. Chamberlin), 3 ♀, 1 juv. Ceralbo Island, Gulf of California, June 6, 3 ♀, 1 juv.

This species has been recorded in the United States from the Gulf of Mexico westward to Fort Yuma, California. The above are the first records for Mexico, in the northern portion of which country *apicedentatus* probably has a very extensive distribution.

ORTHOPTERA

BLATTIDÆ

3. *Blattella germanica* (Linnæus)

Guaymas, Sonora, Mexico, April 15, 1 ♂.

This species is a domiciliary pest, which has been carried by commerce around the world.

4. *Periplaneta americana* (Linnæus)

Guaymas, Sonora, Mexico, April 7, 1 ♀. Angeles Bay, Lower California, May 4 and 5, (Van Duzee and Chamberlin), 1 ♀, 4 juv.

This large cockroach is also a domiciliary insect, widely distributed by commerce and apparently most generally established in warmer temperate and tropical North America.

5. *Panchlora montezuma* Saussure & Zehntner

Guaymas, Sonora, Mexico, April 14, (J. C. Chamberlin), 3 ♀, 3 very small juv.; San José Island, Gulf of California, May 28, 3 ♂, 2 ♀, 2 juv. ♀; Ceralbo Island, Gulf of California, June 6, 3 ♀, 1 juv.

The females from Ceralbo Island are unusually small, no larger than the average males. This distinctive species has never been found except on the shores of the Gulf of California.

6. *Arenivaga rehni* Hebard

Angeles Bay, Lower California, May 4, 2 ♂; Las Animas Bay, Lower California, May 8, (J. C. Chamberlin), 1 ♀; Arroyo Gua, near Loreto, Lower California, May 20, (J. C. Chamberlin), 1 ♀; Puerto Ballandra, Carmen Island, Gulf of California, May 22, (V. Owen), 1 juv. ♂, 4 small juv., 1 ootheca; East Las Galeras Island, Gulf of California, June 13, 1 ♀, 1 small juv.; Ceralbo Island, Gulf of California, June 7, 1 small juv.

This species is known only from Lower California.

7. *Arenivaga erratica* Rehn

Angeles Bay, Lower California, June 26, 4 ♂.

These specimens have the tegmina and wings very diaphanous, approaching the normal condition found in *Eremoblasta subdiaphana* (Scudder). Such individuals are represented in the large series before us from the United States only by males from San Diego and Cottonwood, Mojave Desert, California.

Widely distributed over the southwestern United States, this species has previously been recorded from Mexico only from the state of Durango.

8. *Chorisoneura flavipennis* Saussure & Zehntner

Espiritu Santo Island, Gulf of California, June 1, 1 ♀.

This insect has not been recorded since the original description of material from Atoyac, Vera Cruz, Mexico.

MANTIDE

9. *Litaneutria ocularis* Saussure

Pond Island Bay, Angel de la Guardia Island, Gulf of California, June 30, 1 ♂; Angeles Bay, Lower California, June 26, 1 ♂.

Confusion, caused by subsequent description by Scudder of several doubtful species from the United States, prevents accurate delimiting of the range of this species at the present time. It probably enjoys a wide distribution over the southwestern United States and northern Mexico.

PHASMIDÆ

10. *Pseudosermyle arbuscula* (Rehn)

Angeles Bay, Lower California, May 5, 1 juv. ♀.

This species has not been recorded since the original description of material from San Diego, California.

ACRIDIDÆ

11. *Paratettix hesperus* Morse

Escondido Bay, Lower California, June 14, (J. C. Chamberlin), 1 ♀; San Antonio, Distrito Sur, Lower California, July 15, 1919, (G. F. Ferris), 1 ♀, [Leland Stanford Jr. Univ].

Known on the Pacific Coast from Washington to the Mexican border, the above material is the first to be recorded from Mexico. The San Antonio specimen shows an approach toward *Paratettix aztecus* (Saussure).

12. *Psoloessa texana* Scudder

Guaymas, Sonora, Mexico, April 9 and 14, 1 ♂, 2 ♀; Ildefonso Island, Gulf of California, May 17, (V. Owen), 1 juv. ♀; San Antonio, Distrito Sur, Lower California, July 15, 1919, (G. F. Ferris), 6 ♂, 1 ♀, [Leland Stanford Jr. Univ.]; July 12 to 17, 1919, (J. R. Slevin), 2 ♂, 1 ♀.

The females have the vertex narrower than is usual in Arizona material, but variable in form. The vertex is found to exhibit decided individual variation in this species. This is probably one of the most abundant grasshoppers over the greater portion of the southwestern United States and northern Mexico.

13. *Scyllina viatoria* (Saussure)

San Antonio, Distrito Sur, Lower California, July 15, 1919, (G. F. Ferris), 8 ♂, 4 ♀, [Leland Stanford Jr. Univ.]; July 12 to 17, 1919, (J. R. Slevin), 5 ♂, 1 ♀.

In the United States this insect is known from the vicinity of Tucson, Arizona, to the Mexican border.

14. *Leprus glaucipennis* Scudder

San Antonio, Distrito Sur, Lower California, 1200 feet. July 15, 1919, (G. F. Ferris), 2 ♂, 1 ♀, [Leland Stanford Jr. Univ.]; July 12 to 17, 1919, (J. R. Slevin), 1 ♂.

This handsome insect is known from coastal California as far north as the region of Los Angeles. It has been recorded from Mexico from Durango, San Luis Potosi and Hermosillo, Sonora.

15. *Lactista gibbosus* Saussure

Tortuga Island, Gulf of California, May 11 and June 22, 2 ♂, 2 ♀; South Santa Inez Island, Gulf of California, May 13, 1 ♀; San Antonio, Distrito Sur, Lower California, July 15, 1919, (G. F. Ferris), 12 ♂, 7 ♀, [Leland Stanford Jr. Univ.]; July 12 to 17, 1919, (J. R. Slevin), 6 ♀.

In the United States this insect is known only from the region of Los Angeles to Tia Juana, in California. In Mexico it has been recorded from Lower California and Sinaloa.

16. *Tomonotus ferruginosus* Bruner

San Pedro Bay, Sonora, Mexico, July 7, (V. Owen), 1 ♀.

Though proportionately somewhat less heavy and more elongate than paratypic females of *ferruginosus*, the weaker caudal production of the pronotal disk shows a tendency toward the normal type of *T. mexicanus* Saussure. The coloration of this specimen is cinnamon, shading to rufous. The wings have the disk bittersweet orange (richer and with a slightly greater tincture of pink than in typical *ferruginosus*). The caudal tibiae are pale glaucous, with proximal portion buffy. The ventral and internal surfaces of the caudal femora are dark, except for the distal portion and a transverse post-median band of buff. Length of body 29.8, length of pronotum 8, length of tegmen 27.2, length of caudal femur 16.3 mm.

Known from a small area in southern Arizona and "California," the present specimen is the first of the species to be recorded from Mexican territory.

17. *Trimerotropis vinculata* Scudder

San Antonio, Distrito Sur, Lower California, July 15, 1919, (G. F. Ferris), 1 ♂.

This is one of the most abundant and widely distributed species of the western United States. It has been recorded, as *T. pallidipennis* (Burmeister), from numerous localities in Mexico and as *vinculata* from the state of Chihuahua.

18. *Trimerotropis* sp.

San Pedro Nolasco Island, Sonora, Gulf of California, April 17, 1 ♀.

This same species has been reported from San Diego, California, as *Trimerotropis rebellis* Saussure, but this assignment appears to be questionable. The insect can not be definitely located until the genus has been fully revised.

19. *Anconia integra* Scudder

Patos Island, Gulf of California, April 23, 1 ♂, (grayish); San Pedro Bay, Sonora, Mexico, July 7, (V. Owen), 1 ♀, (green); San Luis Gonzales Bay, Lower California, April 28, 1 ♂, 1 ♀, (brownish gray); Puerto Refugio, Angel de la Guardia Island, Gulf of California, June 29, 1 ♀, (brownish gray); Angeles Bay, Lower California, May 7, 1 ♂, (grayish); Isla Raza, Gulf of California, May 4, 1 ♀, (grayish); Tortuga Island, Gulf of California, May 11, 2 ♀, (brownish gray); Mejia Island, Gulf of California, June 28, 1 ♀, (pale brownish gray).

Known from Tucson, Arizona, and southern Nevada to the Mojave Desert in the United States, the species has not been recorded previously from Mexico.

20. *Heliastus californicus* (Thomas)

Patos Island, Sonora, Gulf of California, April 23, 1 juv. ♀; San Pedro Bay, Sonora, Mexico, July 7, (V. Owen), 1 ♀; Guaymas, Sonora, Mexico, April 7 to 14, 3 ♂, 4 juv. ♀; San Luis Gonzales Bay, Lower California, April 28, 2 juv. ♀; Mejia Island, Gulf of California, April 30 and June 28, 2 ♂; Puerto Refugio, Angel de la Guardia Island,

Gulf of California, May 1, (J. C. Chamberlin), 1 juv. ♂, 1 juv. ♀; Palm Cañon, Angel de la Guardia Island, Gulf of California, May 3, (J. C. Chamberlin), 1 ♀; Pond Island Bay, Angel de la Guardia Island, Gulf of California, June 30, 1 ♀; Angeles Bay, Lower California, May 4 to June 26, (Chamberlin and Van Duzee), 2 ♂, 1 ♀; San Francisquito Bay, Lower California, May 10, 1 ♀; San Marcos Island, Gulf of California, May 12, 1 ♂; Santa Inez Island, Gulf of California, May 13, 2 ♀; Mulegé, Lower California, May 15, 1 ♂; Coronados Island, Gulf of California, May 18, 1 juv. ♀; Loreto, Lower California, May 19 and 20, 1 ♂, 3 ♀, 1 juv. ♀; Monserrate Island, Gulf of California, May 24, 1 ♂; Agua Verde, Lower California, May 28, 1 ♂; San Francisco Island, Gulf of California, May 30, 3 ♂, (small); Cerralbo Island, Gulf of California, June 6, 2 ♀, 1 juv. ♀, (small); San Antonio, Distrito Sur, Lower California, July 15, 1919, (G. F. Ferris), 10 ♂, 10 ♀; July 12 to 17, 1919, (G. R. Slevin), 3 ♂, 6 ♀.

This species is widely distributed over the southwestern United States. It appears generally in the literature as *Heliastus aridus* (Bruner) and until this genus has been thoroughly revised, the number of species and proper names to use can not be definitely stated. In Mexico, *aridus* has only been recorded from Tepic, though in the northern part of that country it probably has a very extensive range.

21. *Calamacris mexicanus* Bruner

San Francisquito Bay, Lower California, May 10, 1 large juv. ♂; Coronados Island, Gulf of California, May 18, 1 juv. ♂, 1 juv. ♀; Loreto, Lower California, May 19 and 20, 2 large juv. ♀; Danzante Island, Gulf of California, May 24, 1 juv. ♀.

This interesting species was previously known only from the unique type, taken at Patrocino, Lower California.

22. *Litoscirtus insularis* Bruner

Turtle Bay, Lower California, 1 ♀.

Like the material originally described, this species was preserved in alcohol and is in poor condition. The type lo-

cality is Cedros Island, Lower California; a female was also recorded, however, from Central America, that locality probably in error.

23. *Clematodes vanduzeei* Hebard, new species

Figs. 1 and 2 p. 329

This insect is closely related to the genotype, *C. larrea* Scudder, described from Mesilla, New Mexico, and subsequently recorded from Lerdo, Durango and Camacho, Zacatecas, Mexico. The genus is near the *Vilernæ*, belonging to the subfamily *Cyrtacanthacrinæ*, though in many respects surprisingly resembling the *Pyrgomorphid* genus *Calamacris*.

The female before us, in the instar preceding maturity, when compared with the females of *larrea*, is found to differ in the more elongate vertex, with apical portion of dorsal surface proportionately more ample (as figured), the numerous longitudinal carinæ of the pronotum are weaker, but the lateral carinæ of the disk show a minute tubercle, projecting more than any other, while the caudal femora are longer, with dorsal genicular lobes decidedly more produced.

Type: Female, in instar preceding maturity, No. 1240, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, July 7, 1921, at San Pedro Bay, Gulf of California.

Compared with *larrea* the present species agrees closely in the majority of features. The following, in addition to those given above, are noteworthy: Size slightly larger, form apparently slightly more slender; vertex projecting beyond the eye by distinctly more than the ocular width; lateral foveolæ facing dorso-laterad, as in *larrea*, but larger; medio-longitudinal carina strong on occiput, obsolete proximad but fine and distinct distad on vertex, as in that species; eyes more elongate; pronotum with caudal margin broadly convex in lateral portions, these meeting meso-dorsad to form a very broad, obtuse-angulate emargination; ventral margin of lateral lobes broadly convex (these features as in *larrea*, but not clearly stated in the original description); prosternal spine very blunt, truncate, almost strongly rounded quadrate (in the Lerdo female of *larrea*, however, this spine is much blunter than in the others and is probably subject to decided individual variation in

the species of *Clematodes*). Mesosternal lobes slightly longer than wide, separated by less than their width as in *larrea* (though given by Scudder as subquadrate, separated by their own width). Small, vestigial tegminal and wing pads present. Dorsal genicular lobes of caudal femora equally produced, slightly longer than basal width (slightly shorter than that dimension in *larrea*), triangular with apices well rounded.

Length of body 26.8, length of vertex 1.8¹, length of antenna 7.4, length of pronotum 4.8, total cephalic width of pronotum 3.3, total caudal width of pronotum 4.1, length of caudal femur 15.8 mm.

General coloration, walnut brown, much overlaid with grayish and showing longitudinal, very slender streaks of dark brown; face with a broad, transverse bar of grayish, margined broadly above and below with a blackish suffusion; caudal femora with narrow and deeply concave ventral surface ferruginous.

The type is unique.

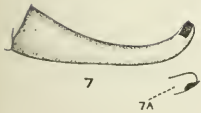
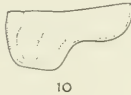
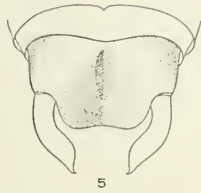
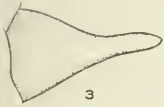
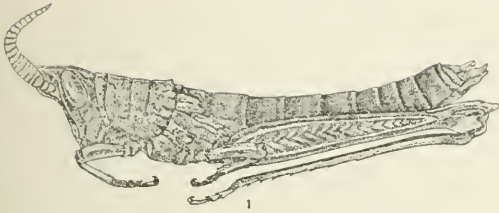
EXPLANATION OF FIGURES

Fig. 1, *Clematodes vanduzeei* Hebard, n. sp., immature female, type, lateral view, x 3. Fig. 2, same, dorsal view of vertex, x 10.5. Fig. 3, *Edomerus corallipes* Bruner, male, lateral view of cercus, much enlarged. Fig. 4, *Insara psaronota* Hebard, n. sp., male, type, dorsal outline of pronotal disk, x 3. Fig. 5, same, dorsal view of apex of abdomen and cerci, x 9. Fig. 6, *Microcentrum suave* Hebard, n. sp., male, type, lateral outline of tegmen, natural size. Fig. 7, same, dorsal view of cercus, much enlarged. Fig. 7a, apex of same in lateral aspect, same scale. Fig. 8, same, ventral outline of subgenital plate, same scale as fig. 7. Fig. 9, same, female, allotype, lateral view of subgenital plate and ovipositor, x 5. Fig. 10, *Eremopedes spinosa* Hebard, n. sp., male type, lateral outline of pronotum, x 2.5. Fig. 11, same, dorsal view of ultimate tergite, x 6. Fig. 12, same, dorsal view of cercus, much enlarged. Fig. 13, same, female, allotype, lateral view of subgenital plate and ovipositor, x 1.5.

24. *Schistocerca vaga* Scudder

Patos Island, Sonora, Gulf of California, April 23, 4 ♀; San Pedro Marti Island, Gulf of California, April 18, 2 ♂, (one very pale); San Pedro Nolasco Island, Gulf of California, April 17, 1 ♀; San Pedro Bay, Sonora, Gulf of California, July 7, 1 ♂, 1 ♀; Guaymas, Sonora, Mexico, April 7

¹ In the females of *larrea* before us this dimension is 1.2 to 1.3 mm.



to 15, 2♂, 1♀; Pond Island Bay, Angel de la Guardia Island, Gulf of California, July 1, 1♀; Isla Partida, Gulf of California, April 22, 2♀, (very pale); Tortuga Island, Gulf of California, May 11, 1♀; June 22, (J. C. Chamberlin), 1♀; San Marcos Island, Gulf of California, June 19, 2♀; Mulegé Lower California, May 14 and 15, 2♂; San Diego Island, Gulf of California, May 27, (J. R. Slevin), 1♀; Espiritu Santo Island, Gulf of California, May 31, 2♀, (one very pale); San Antonio, Distrito Sur, Lower California, July 15, 1919, (G. F. Ferris), 3♀ [Leland Stanford Jr. Univ.]; July 12 to 17, 1919, (J. R. Slevin), 3♂.

This powerfully flying grasshopper is widely distributed over the southwestern United States. It has been recorded from a number of localities in Mexico and from as far south as Realejo, Nicaragua.

EDOMERUS Bruner

After careful comparison with the South American genus *Sitalces* and its relatives, with the North American genera related to *Dactylotum* and with the North American genus *Phaulotettix* of the Group *Melanopli*, we are convinced that much the nearest affinity is with *Phaulotettix*.

The genus violates the usually accepted rule that the *Melanopli* have the dorso-external margin of the caudal tibiae armed with never less than eight spines, for in *O. corallipes* the number of such spines is six or seven. Similar reduction in number of spines is found in *Sitalces*, but there are species of that genus having as many as eight such spines and we do not believe this feature can be used as a group character. The large eyes, with interocular space resultantly very narrow, and form of vertex, resembles species of both *Sitalces* and *Phaulotettix*, agreeing with the latter more closely in having the eyes less projecting laterad. The general form is decidedly more *Melanoploid*.

We therefore remove the genus from the position assigned it by Bruner, near *Sitalces*, and transfer it to the Group *Melanopli*, where it is placed after the genus *Sinaloa* and before the genus *Phaulotettix*.

Compared with *Phaulotettix*, males are separable by the absence of furcula, styliform cerci and much smaller, conical subgenital plate. Females have the ovipositor valves much shorter, in normal position with apices alone projecting. Both sexes are separable from that genus by the proportionately larger eyes, pronotum with shorter metazona and with disk curving more evenly into the lateral lobes, prosternal spine which is low and blunt, narrower tegmina and cephalic and median femora, which have the cephalic ventral genicular angle very strongly and roundly produced (much more so than the caudal ventral genicular angle).

We consider the following characters of generic diagnostic value: Form stout, agreeing closely with that of *Phaulotettix*; head with eyes very large, but not very strongly projecting; pronotum expanding moderately caudad, with disk not produced caudad, its caudal margin very broadly obtuse-angulate concave, prozona nearly three times as long as metazona; tegmina small, lateral, narrowly elongate-oval pads; tympana present; male furcula absent; male cerci simple, moderately elongate, styliform, tapering to the acute apex; lateral margins of male subgenital plate not abruptly ampliate near base; caudal femora short and stout.

25. *Edomerus corallipes* Bruner

Fig. 3, p. 329

1908. *Edomerus corallipes* Bruner, Biol. Cent. Amer., Orth., II, p. 293, pl. IV, figs. 10, 10a, 14 and 14a. [♀; San José del Cabo, Lower California].

1908. *Edomerus nigropleurus* Bruner, Ibid., p. 294. [♂; Cape St. Lucas, Lower California].

Guaymas, Sonora, Mexico, April 7 to 15, 1♂, 3♀, 1 juv. ♀; Mejia Island, Gulf of California, April 30, (J. C. Chamberlin), 1 juv. ♂; June 23, 1♀; Santa Inez Island, Gulf of California, May 13, 1 juv. ♀, 1 juv. ♀; Santa Cruz Island, Gulf of California, May 27, 1♂, 1 large juv. ♂; Espiritu Santo Island, Gulf of California, June 9, 1♂, 1 juv. ♀; La Paz, Lower California, June 3, 2♀; Cape St. Lucas, Lower California, (from Uhler Collection), 1♂

(type of *nigropleurus*), 3 ♀, 1 juv. ♂, 2 juv. ♀. [Mus. Comp. Zool., Acad. Nat. Sci. Phila. and Hebard Cln.].

The series, upon a male from which *nigropleurus* was described by Bruner, shows conclusively the synonymy indicated above. Large lateral dark areas are developed to different degrees in this material. This feature is a striking color variation, but nothing more.

Contrastingly colored individuals before us show a color pattern closely resembling that developed in *Phaulotettix curycercus* Hebard. The majority of the series, however, have this pattern almost obsolete. The even curvature of the pronotum, added to the plainness of coloration, gives such individuals some resemblance to females of *Netrosoma nigropleura* Scudder. Closer examination, however, shows the resemblance to be wholly superficial.

MEASUREMENTS (IN MILLIMETERS)

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur	Width of caudal femur
♂					
Guaymas, Sonora	22	5	3.2	11.2	4
Santa Cruz Island	20.7	5.3	3	11.1	3.9
Espiritu Santo Island	17.7	4.3	3.2	9.8	3.7
♀					
Guaymas, Sonora	28.3 ²	6.1	3.6	13.4	4.7
Guaymas, Sonora	27.8 ³	6.3	4.8	13.8	4.8
Guaymas, Sonora	26.6	6.7	4.2	14.2	5
Mejia Island	28	6.4	4	13.3	4
La Paz, Lower California 25 ⁴		6.7	3.1	14	4.7
La Paz, Lower California 27		6.3	4.1	13.5	4.7

The caudal tibiae are seen to be jasper red or russian blue in the adults. In immature individuals they are pale brown, in a number of cases darkened distad, with dorsal surface there blackish brown.

TETTIGONIIDÆ

26. *Insara psaronota*⁵ Hebard, new species

Figs. 4 and 5, p. 329

The present insect is nearest the Lower Californian *I. lamellata* Rehn & Hebard. From the type of that insect, a female,

² Moderately distended.

³ Slightly distended.

⁴ Shrunken.

⁵ In allusion to the dappled gray dorsal surface of the tegmina in this species.

females of *psaronota* differ in the less strongly lamellate ventro-cephalic margins of the cephalic and median femora distad, ovipositor which is much more suddenly recurved and thus of the form more usual in the species of the genus, in the longer organs of flight and not striking, but distinctive, color pattern.

The vertex has the dorsal surface of the fastigium declivent, this more decided in median section, but individually variable in degree. The same is true for *lamellata* and our present examination convinces us that the vertex in these species is really closer to that of *Brachyinsara magdalenæ* Rehn & Hebard than that of *Insara elegans* (Scudder).

The male before us shows further convergence toward *Brachyinsara* in the strongly and broadly produced ultimate tergite, which completely conceals the supra-anal plate and agrees closely with that of the male of *magdalenæ*. That genus is readily recognized, however, by its decidedly more robust form, distinctively shaped pronotum and rudimentary organs of flight.

Type: Male, No. 1241, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, June 18, 1921, at Coyote Bay in Conception Bay, Lower California.

Size medium, form moderately robust but less heavy than in *lamellata*. Head and eyes much as in that species, as discussed above. Pronotum as in *lamellata* (except that the humeral sinus in the present male is weak, as in females of that species, stronger than in females of *psaronota*); dorsum deplanate, lateral margins weakly defined cephalad, thence subcarinate but not raised above plane of dorsum, straight, convergent caudad in slightly more than cephalic fifth, then with a rounded obtuse-angulation weakly concavo-divergent for an equal distance, in remaining portion gently divergent with a slight concavity apparent, caudal margin broadly convex; lateral lobes appreciably longer than deep. Tegmina rather broad for genus, extending caudad nearly to apices of caudal femora, stridulating area normal for genus. Wings extending caudad well beyond apices of caudal femora. Distal abdominal tergites, except last two, produced dorso-mesad in minute, acute, raised projections as in *lamellata* and *Brachyinsara magdalenæ*; penultimate tergite simple. Ultimate tergite deeply sulcate medio-longitudinally, produced above cerci in a transverse, rounded trapezoidal plate, the median impression so extensive that the tergite appears bilobate. Supra-anal plate not visible. Cerci short, rather strongly incurved, crassate, cylindrical, hardly tapering to the flattened apex which is toothed, this tooth directed meso-distad at an angle; as in *Brachyinsara magdalenæ*. Subgenital plate very short and broad, lateral margins convex-convergent distad and produced in very minute, styliform appendages disto-laterad, between which the distal margin is weakly and bluntly obtuse-angulate produced with sides of

this angulation slightly concave. Cephalic and median femora with ventro-cephalic margins becoming weakly lamellate distad, this slightly stronger than in *Brachyinsara magdalena*, much weaker than in *lamellata*, there armed with (0 to 2, normally 1) spines. Genicular lobes of cephalic and median femora bispinose; of caudal femora strongly acute-angulate produced, unspined.

Allotype: Female, No. 1242, Mus. Calif. Acad. Sci., from San Marcos Island, Gulf of California, Lower California, Mexico. June 19, 1921. (E. P. Van Duzee).

Agrees closely with male, differing as follows: Form very slightly more attenuate; tegmina with marginal field narrowing more gradually distad; ovipositor shorter than cephalic femur, bent sharply upward at base, rounding distad to the angulate but not produced apex; bent portion of dorsal margin and distal portion of ventral margin finely serrulate; subgenital plate triangular with lateral margins weakly convex to the blunt apex, length approximately basal width, surface medio-longitudinally strongly impressed in proximal portion.

MEASUREMENTS (IN MILLIMETERS)

	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur	Length of ovipositor
♂ Coyote Bay. <i>Type</i>	16	4	2.8	21	21	..
♀ San Pedro Bay. <i>Paratype</i>	18	4.2	3	23.1	23.9	5.1
San Marcos Island. <i>Allotype</i> ..	16	3.8	2.7	21.8	20	4.9
San Marcos Island. <i>Paratype</i> ..	16	3.9	2.7	20	19.8	4.8
San Nicolas Bay. <i>Paratype</i>....	..	4.1	2.9	24	22	5

The San Pedro Bay and San Nicolas Bay individuals, though showing distinct elongation of body, organs of flight and limbs, clearly represent the same species.

Coloration: Male. *Type*. Lumiere green, except as follows: abdomen and limbs distad apparently discolored, buffy. Head with occiput clay-color, laterad deepening irregularly to sepia; eyes verona brown; disk of pronotum washed with clay color; stridulating field of tegmina vinaceous-buff, suffused proximo-laterad on each side with clove brown, narrow remainder of anal field to apex of tegmina vinaceous-buff, with minute veins darkened, giving a faintly streaked appearance.

Female. *Allotype*. General coloration light gray, body showing a weak tinge of brown, pronotal disk finely margined laterad with black. Tegmina with delicate black markings in a weak herring-bone pattern. Antennæ moderately annulate distad. The other females are brown or yellowish green, with dorsal surface, particularly of the tegmina, grayish, the tegmina in that area faintly streaked with darker.

Specimens examined: 5; 1 male, 4 females.

San Pedro Bay, Sonora, Mexico, July 7, 1921, (E. P. Van Duzee), 1 ♀, *paratype*.

San Marcos Island, Gulf of California, June 19, 1921, (Van Duzee; Owen), 2 ♀, *paratypes*.

Coyote Bay in Concepcion Bay, Lower California, June 18, 1921, (J. C. Chamberlin), 1 ♂, *type*.

San Nicolas Bay, Lower California, May 17, 1921, (V. Owen), 1 ♀, *paratype*.

27. *Phaneroptera*⁶ *mexicana* Saussure

Mulegé, Lower California, May 14, 2 juv. ♂.

This insect is found in the United States only very near the Mexican Border, from the Chisos Mountains in Texas to the Pacific. It has been recorded from a number of Mexican localities as the synonymous *furculata* of Brunner, its distribution extending far southward in that country.

28. *Microcentrum*⁷ *suave* Hebard, new species

Figs. 6, 7, 8 and 9, p. 329

This insect, when compared with *M. retinerve* (Burmeister), is found to differ in the smaller size, narrower tegmina, with male stridulating field much smaller and immaculate, male cerci more elongate and differently armed, male subgenital plate differently emarginate distad and more widely separated, shorter styles. In the female of *suave*, the ovipositor differs in not having the disto-ventral portion curving broadly distad nor the armed distal margin oblique as in *retinerve*.

Type: Male, No. 860, Hebard collection, collected by J. A. Kurché, December 16-31, 1916, at Mazatlan, Sinaloa, Mexico.

Size small, form slender for the genus. Head much as in *retinerve*, with occiput very weakly convex, vertex declivent, longitudinally faintly subsulcate mesad, with width at transverse sulcus (separating it from

⁶ This name takes the place of *Scudderia*, the latter falling as a synonym, due to the recent genotypic designation made by Caudell.

⁷ The Mexican material of this genus, treated in the *Biologia Centrali-Americana*, is clearly in great need of revision. We find that *M. retinerve* (Burmeister) is a species peculiar to the eastern United States and not occurring anywhere in Mexico. The insect here treated belongs to a distinct, though related, group.

frontal fastigium) distinctly less than twice that of proximal antennal joint. Pronotum smooth, disk with cephalic margin broadly concave, showing an almost obsolete median production (very much weaker than normal in *M. rhombifolium* (Saussure)), caudal margin evenly convex, lateral margins rounding strongly into the vertical lateral lobes, which are much deeper than long, with humeral sinus deep. Tegmina widest slightly beyond apex of the comparatively small and immaculate stridulating area, narrowing gradually thence to the rounded apex, well surpassed by the wings, veins of marginal field in no way thickened or specialized toward costal margin. Ultimate tergite truncate. Supranal plate vertical, simple. Cerci very elongate, cylindrical, slender, tapering slightly and incurved with apices rounded, armed dorsad before the apex with a flattened, chisel-shaped tooth, directed parallel to the shaft with apex extending an equal distance distad. Subgenital plate trisulcate, its apex truncate on each side, rectangulate-emarginate mesad. The truncate disto-lateral apices thus formed each surmounted by a small, simple style, hardly over three times as long as broad. Ventral femoral margins armed with minute spines (in the series as follows: cephalic internal 2 to 3, cephalic external 0, median internal 0, median external 2 to 3, caudal internal 6 to 8, caudal external 5 to 9.)

Allotype: Female, Tepic, Tepic, Mexico. [Hebard Collection.]

Very similar to male, differing as follows: Size larger, form more robust. Tegmina broader and showing somewhat greater narrowing beyond proximal portion. Ovipositor very small, curved suddenly and moderately strongly dorsad in proximal portion; dorsal valves with dorsal margin rounding evenly to apex, armed distad with minute teeth which in distal portion are elongate; ventral valves unarmed to disto-ventral angle, which is sharply rounded-rectangulate, the short distal margin transverse and armed with elongate teeth, of which the dorsal is decidedly the longest. Subgenital plate small, triangular, embracing base of ovipositor, with apex blunt.

MEASUREMENTS (IN MILLIMETERS)

	Length of body	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of ovipositor
♀						
Mazatlan, Sinaloa. <i>Type</i> ...	17.5 ^s	5	35	8.8	20.1	..
Tepic, Tepic. <i>Paratype</i>	20.2	5.7	37	8.9	21.2	..
♀						
Guaymas, Sonora. <i>Paratype</i>	20.5 ^s	5	39.8	12	21.4	5
Tepic, Tepic. <i>Allotype</i>	20 ^s	5.7	37.1	11.9	19.7	4.8
Tepic, Tepic. <i>Paratype</i>	23	5.8	38.4	11.8	23	4.9

General coloration course green, approaching light cendre green on body. Stridulating field of male tegmina immaculate. Eyes dresden brown. Enlarged proximal portion of cephalic tibiae buffy overlaid with

* The body of this specimen is shrivelled.

vinaceous, the tympana themselves with a blackish line and those of the caudal surfaces with a suffusion dorsad of the same.

Specimens examined: 5; 2 males and 3 females.

Guaymas, Sonora, Mexico, April 7, 1921, (E. P. Van Duzee), 1 ♀, *paratype*.

Mazatlan, Sinaloa, Mexico, December 16 to 31, 1916, (J. A. Kusche), 1 ♂, *type*, [Hebard Cln.].

Tepec, Tepec, Mexico, 1 ♂, 2 ♀, *paratype*, [Hebard Cln.].

29. *Orchelimum unispina* (Saussure & Pictet)

San Carlos Bay, Guaymas, Sonora, July 8, 2 ♂, 1 juv. ♀; Mulegé, Lower California, May 15, 1 ♂.

The adults before us have fully developed tegmina and wings, showing no reduction. This species was previously known only from the states of Vera Cruz and Jalisco, Mexico.

30. *Eremopedes spinosa* Hebard, new species

Figs. 10, 11, 12 and 13, p. 329

This is a large species, equalling in size *E. cphippiata* (Scudder) and is readily distinguished from the known forms of *Eremopedes* by the conspicuous though shallow first transverse sulcus of the pronotum, the very strong humeral sinus with margin there deeply though broadly concave, the bispinose genicular lobes of the cephalic and median femora and unspined external genicular lobes of the caudal femora, the heavily spined ventral femoral margins (except the caudal of the cephalic femora), the differently specialized ultimate tergite and subgenital plate of the female and the male genitalia. The male cerci are of a type similar to that developed in *E. balli* Caudell, but decidedly more elongate and slender.

The dark marking of the male tegmina occurs only distad of the stridulating field as a broadly suffused, transverse band.

Type: Male, No. 1243, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 28, 1921, at **Mejia Island, Gulf of California**.

Size large for the genus, form normal. Head normal for the genus, much as in *cphippiata*. Pronotum ample, produced in caudal portion with caudal margin truncate, first transverse sulcus decided, median transverse sulcus decided only on lateral lobes, surface toward ventral

and caudal margins of lateral lobes showing a broad marginal angulation; lateral lobes deep, ventral margin nearly horizontal, entire caudal margin decidedly, though broadly concave, so that the lateral lobes are roughly trapezoidal. Tegmina projecting briefly beyond pronotum, stridulating area covered by caudal production of disk, surfaces weakly convex, caudal margins broadly rounded. Prosternum unarmed. Ultimate tergite produced in two spiniform processes which are slightly divergent and faintly decurved, slightly shorter than the width between their apices. Cerci cylindrical, nearly straight, internally with a truncate projection at base of distal third, this projection armed from near proximal portion to distal angle with rough denticulations, distal third of cercus one and one-half times as long as the projection, tapering to the bluntly rounded apex. Subgenital plate with two heavy rounded carinae which weakly converge distad, to the base of the small styles, which are separated a distance slightly longer than one of them, the caudal margin of the subgenital plate in this interval concave. Internal genicular lobes of caudal femora unispinose, others as described above. Ventral femoral margins armed with spines (in the series, as follows: cephalic internal 3 to 5, cephalic external 0, median internal 2 to 5, median external 3 to 6, caudal internal 5 to 9, caudal external 5 to 9). Cephalic tibiae with dorso-caudal margin armed with a proximal, median and apical spine.

Allotype: Female, No. 1244, Mus. Calif. Acad. Sci., same data as type.

Agrees closely with male, differing as follows: Size slightly larger. Tegmina small, vestigial, lateral pads, concealed by pronotum. Ultimate tergite medio-longitudinally sulcate and with caudal margin produced in two minute, acute projections above each side of the very small supra-anal plate. Ovipositor elongate, weakly curved dorsad, base stout, apex very sharply acute, the dorsal valves with a medio-longitudinal, linear carina only near apex itself. Subgenital plate heavy, embracing base of ovipositor, truncato-lobate on each side, distal margin transverse and broadly concave.

MEASUREMENTS (IN MILLIMETERS)

		Length of body	Length of pronotum	Caudal width of pronotum	Total length of tegmen	Length of caudal femur	Length of ovipositor
♂							
Mejia Island.	<i>Type</i>	25	8.7	5	5.8	24	..
♀							
Mejia Island.	<i>Allotype</i>	26.2	9	5.4	..	24.2	19
Mejia Island.	<i>Paratype</i>	30.8 ⁹	8.9	5.2	..	25.7	18.8
Mejia Island.	<i>Paratype</i>	25	8.8	5.1	2.2	23.4	19.8
Pond Island Bay.	<i>Paratype</i> ..	24	9	5.2	..	26.6	21

The antennae are exceedingly long, in the type 62, in the allotype 73 mm.

⁹ Body squeezed out.

General coloration sayal brown, apparently immaculate except for a weakly darker suffusion on the apices of the caudal femora, preceded by a weakly paler area, and a weakly darker suffusion of the bases of the caudal tibiae. The tarsal joints are light ochraceous-buff, with lobes of penultimate joint heavily suffused with blackish brown. Tegmina of male cinnamon-buff, with a broad blackish, irregular, transverse suffusion across their distal portion beyond the stridulating area.

Specimens examined: 6; 1 male, 4 females and 1 immature individual.

Mejia Island, Gulf of California, June 30, 1921 (J. C. Chamberlin), 1 juv. ♀; June 28, 1921 (E. P. Van Duzee), 1 ♂, 3 ♀, *type*, *allotype* and *paratypes*; Pond Island Bay, Angel de la Guardia Island, Gulf of California, June 30, 1921, (E. P. Van Duzee), 1 ♀, *paratype*.

GRYLLIDÆ

31. *Cryptoptilum hesperum* Rehn & Hebard

San Carlos Bay, Sonora, July 8, 1 ♀.

This insect was hitherto known only from Lower California.

32. *Hoplosphyrum boreale* (Scudder)

San Pedro Bay, Sonora, July 7, 1.

The present species is known from numerous localities in the southwestern United States and from Lower California.

33. *Nemobius cubensis mormonius* Scudder

San Carlos Bay, Sonora, Mexico, July 9, 1 ♂; Mulegé, Lower California, May 14, 1 ♀.

This cricket is widely distributed over the southwestern United States and northern Mexico, being known from the latter country as far south as the state of Tabasco.

34. *Gryllus assimilis* (Fabricius)

Georges Island, Gulf of California, April 26, (J. C. Chamberlin), 1 ♂; Angeles Bay, Lower California, May 5, 1 ♀; Loreto, Lower California, May 20, 1 ♀.

This common field cricket is found almost everywhere in America where Orthoptera occur.

35. *Æcanthus californicus* Saussure

Espiritu Santo Island, Gulf of California, June 9, 1 ♂; San Pedro Bay, Sonora, July 7, 2 ♀; Sierra El Taste, Lower California, 3 ♂, 4 ♀, [Hebard Cln.]; San Lazaro, Lower California, 1 juv. ♀.

Considerable confusion still exists in the nomenclature of this genus and the distribution of the present species can, in consequence, not be definitely stated. It appears to be the most abundant species of *Æcanthus* in the regions surrounding the Gulf of California and occurs also in New Mexico, Arizona and California.



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XVI

**EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹**

A REVISION OF THE GENUS ANISEMBIA, WITH
DESCRIPTION OF A NEW SPECIES FROM
THE GULF OF CALIFORNIA

BY

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During the spring and early summer of 1921, while a member of the California Academy of Sciences' expedition to the Gulf of California, I made a small collection of Em-biids, which upon study are found to represent a single species which is here described as new under the disputed genus Anisembia, whose validity it is desired to establish in this paper.

I wish to thank Dr. Barton Warren Evermann of the Academy for his kind permission to report upon this collection. Thanks are also due Dr. R. V. Chamberlin, of the Museum of Comparative Zoology, for various comparisons and for examination of material and types in the collections of that institution. Finally, I am indebted to Prof. G. F. Ferris of Stanford University for valuable assistance and criticism.

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

July 21, 1923

The genus *Anisembia* has been the source of some confusion, largely because of the remarkable character upon which it is principally based, i. e., a single segmented left cercus in adult males. Enderlein, because of his belief in the impossibility of this character, reduced the genus to synonymy, but that he was unjustified in his conclusions seems to be certain. In the first place, he could scarcely have carefully read Melander's account of the development of *Embia texana*, which Krauss designated as the genotype. Had he done so, he must have seen the passage in which Melander (1903, p. 101) refers to the final moult of the male nymph, viz: "The nymph stage is of short duration, lasting probably not more than a week. Towards the end of that time the outer cuticle begins to separate. The *single-jointed* (the italics are mine) left cercus can be seen through the loosened chitin, extending into the second joint and reminding one of the figures of the Forficulid, *Dyscritina*." It is obviously impossible that the second segment of this cercus could be lost before the moult was completed, and Enderlein's comment that the disputed segment was broken off is certainly not justified in this species, at any rate. Furthermore, in Melander's figures of his two species, he distinctly shows setæ growing uniformly over the truncate end of the left cercus, which certainly indicates that the point of attachment, if there be such a thing, is extremely obscure. Finally, to settle the matter definitely. I have had the types of Melander's two species carefully examined by Dr. R. V. Chamberlin, who says "There isn't the slightest evidence that a second segment was ever present in the left cercus of the male in *wecleri*. The joint present is longer than the first of the right side, is enlarged at the end and curved, with setæ over its entire distal surface. We apparently have only females of *texana*, in which both cerci are two-jointed as usual. I have no doubt the asymmetry in the cerci of the males of these species is normal." As to *Anisembia sini*, new species, it can definitely be stated that the left cercus is normally of but one segment, there being not the slightest evidence of any point of articulation for another segment.

It must be remembered that Enderlein was working without material of these two species, and since it is a common thing

to find this segment broken off, it was but natural for him to reason that this must be the case as regards *texana* and *whecleri*.

One of Enderlein's species, *Oligotoma heymonsi*, described at this time, I am also inclined to place, provisionally at least, in this genus (Enderlein, 1912, p. 114, figs. 74-76). Careful examination of the type will be necessary before this can be definitely decided. The reasons for suspecting that this species should be placed here, are as follows:

In the first place, Enderlein's figures show but a single segment to the left cercus which very nearly approximates in shape that of the other species of this genus and, although he indicates a point of attachment for a second segment, I am inclined to believe him mistaken. Examination of his figures as compared with those of all other species of *Oligotoma*, certainly shows it to be a widely aberrant form of the genus, even granting the presence of a second cercal segment. As a matter of fact, the general genitalic structure places it much closer to *A. whecleri* and *A. texana* than to any other species of *Oligotoma* I have seen figured. Enderlein recognizes this resemblance to *texana* when he states on page 115: "Die *Olig. texana* (Mel. 1902) aus Texas unterscheidet sich durch den Genitalapparat und durch die kastanienbraune Färbung von Prothorax, Kopf und Vorderschenke." Of course, if a careful examination of his type should show genuine evidence of the presence of a second segment it will either fall out of this genus or necessitate the defining of broader generic limits.

There is one statement in Melander's paper of 1903 which might cause confusion in this connection. On page 104 he says: "The males of three species (*tartara*, *texana* and *whecleri*) have the left cercus always single-jointed and the right one two-jointed. So far as can be judged from the descriptions, all other species (except possibly *mauritanica*) have both appendages two-jointed in the male as well as in the female." In part, his statement is misleading. While *Embia tartara* (Sauss.) was described as having a single segmented left cercus, this was undoubtedly an error, as the rest of the genitalic structure places it naturally and definitely in the genus *Embia*. Furthermore, Krauss gives a careful

redescription of the species from the type, and in his figures indicates the missing segment by a dotted outline. As careful an observer as his beautiful work shows him to be, would scarcely have done this unless there were some genuine evidence of its presence. (Krauss, Plate V, fig. 22.) As for *Embia mauritanica* (Lucas), this species is definitely described and figured as having the cercus normally segmented. (Krauss, Plate IV., fig. 20.)

Of the four species here considered as belonging to *Anisembia* but two have had winged males described. These are *A. heymonsi* and *A. texana*, where again a strong resemblance is found, these two species possessing the most reduced wing venation of any members of the order.

There is a possibility that a fifth described species of *Embiid* may be found to belong to this genus. This is *Embia californica* (Banks). Nothing definite can be decided, however, until adult males have been collected. There have been collected in some numbers in the vicinity of Stanford University, females of an *Embiid* which I am inclined to believe belongs to this species, in which case resemblances between these females and those of *Anisembia sini*, make it appear very probable that the two are congeneric. *Embia californica* was described from a male nymph collected near Los Angeles, California. The type is now in the collection of the Museum of Comparative Zoology at Cambridge, Mass.

The males of this interesting genus may be separated by means of the following key. Since the female of but one of these species has been adequately described, it is impossible to either separate the species by the characters of this sex, or, as it stands at present, to even place them safely generically.

1. Left half of supra-anal plate blunt posteriorly, with no definitely slender, caudally projecting process. Right half of supra-anal plate terminating caudad in a peculiar, flattened, bifurcate process. Length 6.5 mm.....*wheeleri* (Melander).
Left half of supra-anal plate terminating caudally in a definitely slender process..... 2
2. Process of left supra-anal plate comparatively short, not extending as far posteriorly as terminal point of the process of the right supra-anal plate. Left process sharply truncate and with a chisel-like edge. Process of right supra-anal plate terminating in a long slender, sharply acute, process which normally extends caudo-laterally. Length 9 mm.....*sini*, n. sp.

- Process of left supra-anal plate slender; projecting further posterior than terminal point of right supra-anal plate..... 3
- 3 Process of the left supra-anal plate simple and pointed; right supra-anal plate also terminating in a simple sharply acute point. Length 6 mm.....*texana* (Melander)
- Process of left supra-anal plate terminating in a small strongly recurved hook. Right supra-anal plate terminating in a peculiar bifurcate process or hook. Length 5 mm.....*heymonsi* (Enderlein)

ANISEMBIA Krauss

1902—*Embia* Melander, p. 19.

1902—*Olynta* Melander, p. 17.

1911—*Anisembia* Krauss, p. 74.

1912—*Oligotoma* and *Haplocmbia* Enderlein, p. 109.

Orthotype, *A. texana* (Melander). Texas.

Male: Left cercus composed of a single segment which is strongly clubbed on its inner margin; supra-anal plate divided into two asymmetrical portions; wings present or absent; if present, venation much reduced; particularly striking is the obliteration of the costa and median which appear only as pigment streaks; bases of subcostal, radial, cubital and anal veins present.

Female of the usual larva form and with both cerci two segmented.

This genus is known only from Mexico and southern Texas. (Possibly it is also found in California.)

1. *Anisembia texana* (Melander)

1902—*Embia texana* Melander, pp. 19-20 and p. 26, figs. 2a-b and 3a-f.

1903—*Embia texana* Melander, pp. 98-118, figs. 1-6.

1906—*Embia texana* Mel., Friedrichs, p. 238.

1911—*Anisembia texana* (Mel.) Krauss, pp. 74-75, fig. F.

1912—*Oligotoma texana* (Mel.) Enderlein, p. 92, fig. 62 and p. 109.

Types: The holotype, a female, is in the collection of the Museum of Comparative Zoology at Cambridge, Mass. The allotype is probably in Melander's collection.

Remarks: This species is known only from Austin, Texas, where it was collected in Pease Park under stones, logs and under the bark of a fallen log, from November to March and also after the spring rains in May, at which time adult males were not uncommon.

2. *Anisembia wheeleri* (Melander)

1902—*Olyntha wheeleri* Melander, pp. 17-18, figs. 1a-b.

1911—*Anisembia wheeleri* (Melander) Krauss, p. 70, fig. G.

1912—*Haploembia wheeleri* (Melander) Enderlein, p. 70, fig. 41 and p. 109.

Types: The holotype is in the collection of the Museum of Comparative Zoology at Cambridge, Mass.

Remarks: This species was described from a single apterous, adult male, which was collected at Cuernavaca, Mexico, December 26, 1900, by Dr. Wm. M. Wheeler while excavating a nest of *Leptogenys wheeleri* (Forel.)

3. *Anisembia* (?) *heymonsi* (Enderlein)

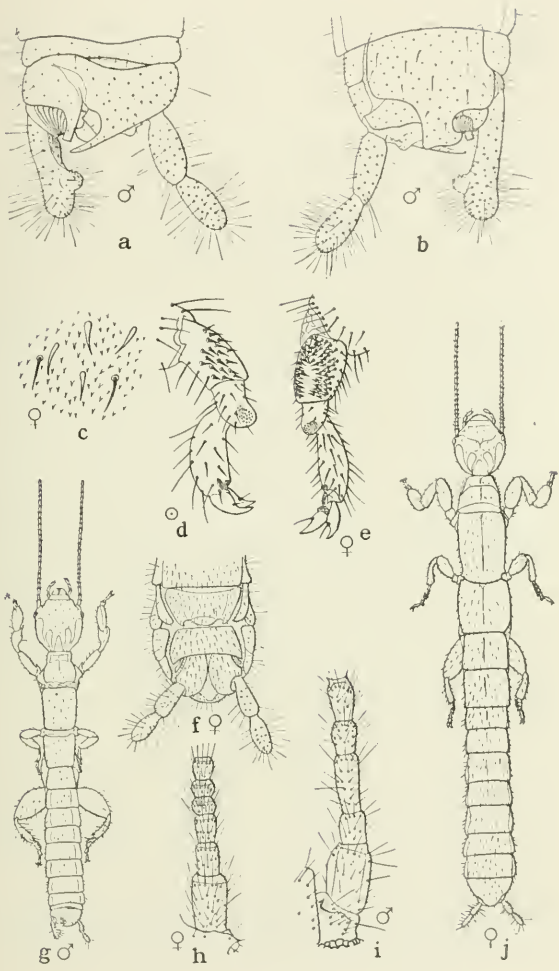
Holotype and only known specimen in the collection of the Berliner Zoologischer Museum.

Remarks: This species was described from a winged male, collected by C. A. Purpus in the Sierra Mixteca, Mexico.

4. *Anisembia sini* J. C. Chamberlin, new species

Male: *Color* (in alcohol); head reddish, labrum somewhat yellowish, basal segments of antennæ same color as head, other segments darkening distally; head with symmetrically arranged lighter areas, indicated in fig. g, by light lines; prothorax almost blackish, with a rectangular, light reddish, transverse area on anterior part of prothorax; between prothorax and mesothorax is a thin, white and much folded membrane which in contrast with the dark chitinous areas of the thorax, gives the insect a striking "collared" appearance; meso- and metathoracic shields almost black; abdomen very deep brown, somewhat reddish; supra- and subanal plates of genitalia almost black; legs and all ventral parts (excepting head which is same color as dorsally), a very dark reddish brown.

Morphological characters: *Mouthparts* so far as can be seen present no unusual features. Segments of maxillary palpus bear the following length ratios: 8:5:6:10:13, those of the labial palpi, 6:7:12. Antennæ as long as thorax, composed of 23 segments of which the first eight bear the following length ratio: 12:7:11:6:7:5:8:9; 9, all other segments about same length as 7th and 8th. *Head* longer than broad, attaining greatest width at eyes. Eyes close to posterior base of antennæ, emarginate anteriorly and reaching greatest width dorsally; submentum a prominent rectangular transverse sclerite, emarginated both anteriorly and posteriorly. *Thorax*: The lengths of the thoracic segments approximate the following ratio: 11:13:9; entirely apterous. Legs present nothing particularly striking; tibiæ of prothoracic legs with a forward projecting, stout spine or process, which is closely appressed to side of spinning segment of tarsus; spinning seg-



ment with a definite longitudinal furrow which appears as a dark line; mesothoracic legs weakly developed; metathoracic femora robust, strongly convex anteriorly, articulated with a prominent crescent-shaped trochantin; all legs with three segmented tarsi. The leg segments bear the following ratios to each other, (always beginning with femur):

Prothoracic legs, 3.2: 2.6; 2.7: 0.5: 1.

Mesothoracic legs, 3.2: 3.7; 2.4: 0.75: 1.

Metathoracic legs, 6: 4.5: 1.25: 0.58: 1.

Abdomen, consisting of ten visible segments, of which the ninth is very much narrowed longitudinally and tenth specialized into the external genitalic claspers; first sternite reduced to a small triangular sclerite placed between coxæ of posterior legs. *Genitalia*, (Figs. a-b); supra-anal plate divided dorsally by a deep cleft and furrow into two strongly asymmetrical parts; actual cleft extending only part way but a deep furrow continues, almost, though not quite to posterior edge of ninth tergite; left side of supra-anal plate extending caudally in a distinct process with a sharply truncated, chisel-like end; club of left cercus beset with fine tubercles; left cercus flattened inside between knob and much-folded basal membrane; right supra-anal plate terminating in a slender caudo-laterally projecting process; between ninth and tenth tergites is a small lanceolate, membranous depression; sternum of ninth segment apparently fused with that of tenth to form sub-anal plate, or possibly reduced to the small sclerite on right of sub-anal plate; on left side of sub-anal plate appear two small sclerites which apparently belong to tergites of ninth and tenth segments; projecting from beneath sub-anal plate and towards the right cercus is a roughly quadrangular chitinized plate, and immediately posterior to this is a membranous area which forms posteriorly a small projection, from beneath which extends the process of the right supra-anal plate; at base of left cercus is a small triangular chitinized plate which covers the bottom of the basal membrane and is best seen from the dorsal aspect; projecting from beneath inner curve of right supra-anal plate and between it and the hook of sub-anal plate is a small, right angled, chitinized projection or tooth. *Length* 9 mm.

EXPLANATION OF FIGURES

Fig. a. Dorsal aspect of ♂ genitalia, Fig. b. Ventral aspect of ♂ genitalia; Fig. c. Spinning spines of ♀; Fig. d. Tarsus of third leg of ♀; Fig. e. Tarsus of third leg of ♀; Fig. f. Genital operculum and terminal ventral segments of ♀; Fig. g. General dorsal aspect of ♂, x 12; Fig. h. Right antenna of ♀, same scale as Fig. i; Fig. i. Right antenna of ♂, same scale as Fig. h; and Fig. j. General dorsal aspect of ♀ x 13.7.

All figures except g and j were outlined with the aid of the camera lucida. Stippling in Figs. a, b and f indicates membranous areas; Figs. a, b, g and i are from the holotype, Figs. c and e from a paratype from Espiritu Santo Island, Fig. d from a juvenile specimen from Espiritu Santo Island, Figs. f and h from the allotype, and Fig. j from a second paratype from Espiritu Santo Island.

Female: *Color* (in alcohol) much lighter in general than male; head same as in male; thorax and abdomen dark brown, somewhat reddish; appendages lighter; membranous collar between pro and mesothorax obscure; genital operculum a little darker than remainder of abdomen.

Morphological characters: *Head*, mandibles heavy, with two or three indistinct, blunt crushing teeth; lacinia of maxillæ with two stout terminal teeth and armed along its keel with a series of 18 or 19 heavy, blunt and rather long, tooth-like setæ, and₁ in series with and caudad of them are 3 or 4 smaller, acutely pointed setæ; inner surface of labrum with a double row of inwardly projecting, short, heavy and blunt setæ, about 32 to the row; segments of the maxillary palpus bear the following ratio: 9: 6: 6: 8: 14, that of the labial palpus, 7: 7: 14; mentum and submentum as in male; antennæ consist of at least 22 segments (a paratype from Espiritu Santo Island with the tip of antenna broken off, has this number while a paratype from Santa Inez Island has a perfect antenna consisting of 19 segments); first nine segments of antennæ of allotype bear the following ratio: 11: 6: 6: 4: 4: 6: 6: 10: 10. *Thorax* presents no special features; segments bear following ratio: 5: 10: 7; legs typical; spinning spines of basal segment of anterior tarsus differ in no essential from those of other species (Fig. c); the remarkable comb of setæ on the third tarsus as compared with that of a juvenile specimen is illustrated in figs. d and e, they being much more numerous in adult specimens; the proportions of the leg segments may be tabulated:

Prothoracic legs 4.5: 3.8: 4: 0.25: 1.

Mesothoracic legs 3.8: 3.6: 2.2: 0.6: 1.

Metathoracic legs 9.8: 5.6: 1.4: 0.8: 1.

Abdomen, genital operculum on ventral side of eighth segment, consisting of a weakly chitinized shield as shown in fig. f; cerci symmetrical, the length ratio of their segments being as 15:13; on some specimens they appear very slightly asymmetrical. *Length* 12.5-13.0 mm.

Second (?) stage larva

Color, pale whitish, somewhat translucent.

Morphological characters: Mandibles with three teeth, more deeply incised than in adult female; keel of lacinia with but 8 or 9 heavy setæ as compared with 18 or 19 in adult female; rows of setæ on the epipharyngeal surface of the labrum but 8 or 9 as compared with the 30-33 in adult females. Antennæ of 11-14 segments; scarcely as long as head and prothorax. Fig. e illustrates the small number of setæ in the tarsal comb of third legs at this period as compared with the large number in adult females. Total length 4 mm.

Half grown (?) larva

Color, pale, much lighter than in adults.

Morphological characters, mandibles as in second stage larva; keel of lacinia with 12 or 13 setæ; epipharyngeal surface of labrum with about 16 setæ to the row. Antennæ of 20 segments. Total length 7 mm.

Remarks: Typical of all stages and both sexes is the fairly abundant vestiture of minute setæ. The lighter areas of the head are, however, practically destitute of these setæ as well as certain parts of the thorax. On the palpi, antennæ and cerci these setæ are longer and much stouter and apparently tactile in function.

Two immature stages were taken as described above. They are placed doubtfully in the classes named above, on the basis of Imms' work of 1913, and I believe them to be correct. The second stage represents the instar following the first moult after hatching.

All measurements, excepting those of total length are entirely relative and proportional and are not necessarily "cross comparable", for example the figure representing the length of a palpal segment is not proportional to the length of an antennal segment, etc. In all cases, the proportions start with the basal segments of appendages and with the anterior segment of the body proper. In the case of the legs, the basal measurement is the femur.

Type: Male, No. 1245, *allotype* female, No. 1246, Mus. Calif. Acad. Sci., collected by author, May 19, 1921, at **Loreto, Lower California.**

Material other than types. Two female paratypes from South Santa Inez Island and four from Ilsa Partida of Espiritu Santo Island. A fair series of second stage (?) larvæ from Isla Partida of Espiritu Santo Island and two specimens of the half grown (?) larvæ from San Esteban Island.

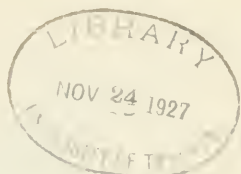
Geographical distribution. This species in all probability ranges over all the Islands in the Gulf and on both its shores. Although specimens were taken at comparatively few places, their webs were noted almost everywhere, and my field note book contains a fair number of references to them, the gist of which notes are here given for what they may be worth.

Field Notes. San Esteban Island: "Embiid webs numerous in fallen 'mesquite' leaves and under stones, but the insects themselves were scarce, only two individuals being collected." South Santa Inez Island: "Two Embiids found under stones in their ramifying tubular webs, which were very abundant everywhere, under and between stones and at the roots of

various plants, around a species of Amaranth in particular, the decaying leaves and stems of which probably furnish their food supply." Loreto, Lower California: "Embiids, male and female, found under large stone at base of small Bursera. Other webs were numerous, especially under cattle droppings, upon which they almost surely feed. The male was found in a web distinct from that of the female, but under the same stone." Isla Partida of Espiritu Santo Island: "Several Embiids found in their galleries which ramify in great abundance throughout the dead morning glory leaves in a small grove of *Cercus pringlei*, near the well. Comparatively few insects were collected, owing in large part, I believe, to the excessive dryness. The webs were so abundant in many places as to give to the whole mass a white, silky sheen. The small, immature forms were usually found in little colonies scattered here and there." Indian Village, Tiburon Island: "A single Embiid found in its web. Other webs seen but no more specimens taken." Unfortunately this latter specimen was later lost. Localities where the notes only record the presence of Embiid webs are as follows: "Palm Cañon," seven miles north of Pond Island on Angel de la Guardia Island; Coronados Island; del Cuesta Blanca (seven miles north of Loreto); Carmen Island; Puerto Escondido, Lower California; Monserrate Island; Agua Verda Bay, Lower California; and San Josef Island.

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XVII

**EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹**

**NEW AND LITTLE KNOWN PSEUDOSCORPIONS,
PRINCIPALLY FROM THE ISLANDS AND
ADJACENT SHORES OF THE GULF
OF CALIFORNIA**

BY

JOSEPH C. CHAMBERLIN

Stanford University, California

The specimens upon which this paper is based were collected principally by the author, while a member of the California Academy of Sciences Expedition to the Gulf of California during the spring and summer of 1921. Many interesting species were collected, the majority of which are new. Among the most interesting of the new species is one which represents a new genus *Sternophorus* which falls in a new subfamily, *Sternophorinae*. Several others such as *Garypinus* and *Minniza* represent genera which are new to North America.

I wish to thank Dr. Barton Warren Evermann and Mr. E. P. Van Duzee of the Academy for the privilege of working up this interesting collection. I also desire to extend my sincerest thanks to Prof. G. F. Ferris of Stanford Univer-

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

July 21, 1923

sity for much kind and helpful criticism and for many valuable suggestions. My grateful acknowledgments are also due Dr. R. V. Chamberlin of the Museum of Comparative Zoology at Cambridge, Massachusetts, for aid with the literature and for the privilege of examining certain types belonging to that institution.

As I have in preparation a monograph of the North American Pseudoscorpions, I have made some of the descriptions somewhat briefer than I should otherwise have done. I believe, however, that the majority of points of systematic value are included, and in many cases the more important characters are figured.

As I am working with material prepared by a special technique I believe it desirable to give a brief account of the process. Essentially it is the same as is universally used in the making of the better preparations of the Coccidæ or scale insects. It consists primarily of softening the body contents in caustic potash (KOH) and, after their removal, in staining and mounting the animal in Canada balsam. (For details of the method see: Ferris 1918 pp. 8-10). Owing to size and convexity of the palpi and carapace it is necessary in most cases to dissect off a fore and hind leg and often one of the chelicerae, which are then mounted separately or upon the end of the same slide upon which the rest of the animal is mounted. Such characters as are apt to be damaged or lost in the preparation may easily be noted beforehand, i. e. the structure of the galea and the color. I have consistently ignored the color in the preparation of this paper. There is such a wide variation due to such causes as the time elapsed since the last moult, the age, etc., that I believe this character to be almost entirely worthless, the more so since the group as a whole is remarkably uniform in coloration. The types and some of the paratypes of most of the species dealt with in this paper are prepared in this way. The importance of a partial dissection and clearing in KOH of a specimen for really careful study cannot be overestimated. With, who has done the most thorough and critical work that has ever been published on this group, also states that to get the best results it is necessary partially to dissect the specimens. (With, 1906, p. 58 and 1908, pp. 219-220.)

In connection with a number of the species figures are given of the male genitalia. As the relationships of the various parts of the genitalia are not, as yet, thoroughly worked out, allowance must be made in comparing specimens with the figures, not only for distortion in the specimen in hand but also for the distortions inevitably resulting from the mounting process and which are undoubtedly incorporated to some extent in the figures. Particular care must be taken not to pay undue attention to variations in the proportions and shapes, and even to a certain extent to the degree of chitinization, of many of the chitinous structures. Taken as a whole they have a very characteristic and fairly constant general appearance and will undoubtedly be found to be of very considerable taxonomic importance. It seems that in some, if not all, cases the genitalia will be of more value in defining genera than species. There is apparently an exception to this in the genus *Garypinus* where, as will be seen by comparing the figures (Plate I, figs. 1-4), there are well defined differences among the species.

Since there has been some confusion and but little uniformity in the morphological terms used within this order, it is desirable to define some of these as employed herein. The following terms are used exactly as defined by With (1906, pp. 12-25, 34-46 and 1908, pp. 219-220), galea, serrula exterior, serrula interior, lateral subterminal setae, accessory teeth, and tarsal tactile hairs of third and fourth legs. Instead of "cephalothorax" for the dorsal shield of the cephalothorax, the more accurate term, carapace, is used. The *chelicerae* are the *antennae* of With. In referring to the legs, the femoral articulation is the suture or joint which divides the femur into two subsegments. This division is the rule so far as the Pseudoscorpionida are concerned, the absence of this feature being exceptional. Femur pars basalis and pars tibialis, respectively, are used in referring to the basal and distal parts of the femur. (For a thorough discussion of the femur, see With, 1906, pp. 35-41.) In many cases the femoral parts form perfectly distinct and movable segments and again they are separated by only a narrow suture, in which case the basal part has often been referred to as the *trochantin*. In referring to the abdominal

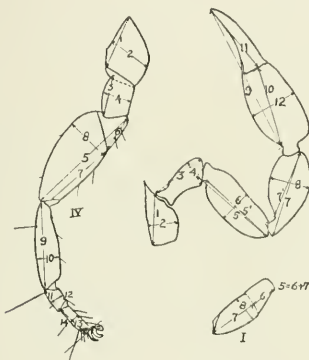
segments, tergites and sternites are used in preference to the usual cumbersome terms of dorsal and ventral scutæ. The *tergal hooks* of the males of the genus *Chelifer* are the modified, posteriorly prolonged and crested distal edges of the tergites.

Measurements are given of the individual segments of legs I and IV and the palpi, and also the length and greatest breadth of the carapace. All these measurements are strictly comparative, the actual dimensions of the parts themselves being rather too variable to be of value. In order to give an idea of the actual size of the arachnid the total length, exclusive of the chelicere is given in millimeters. Since the entire value of measurements lies in their strict comparability it is important that measurements for comparison with the ones given herein, be taken in the same way. The method and "key" points used in making measurements for this paper are easily seen from the figure (text fig. 1). In the measurements of the carapace the median length and greatest width are given. The measurements of each individual segment are enclosed in parentheses and in all cases length precedes breadth. Appendages are always measured in the following order, coxa, trochanter, femur, tibia and tarsus. When the femoral parts are movably articulated the dimensions of the individual parts are given instead of the dimensions of the femur as a whole, but they are still kept within the same parenthesis. In case the articulation is immovable or nearly so, and also in the case of the claw of the palpus, the total length is given first, then the length of the basal division (hand of claw), then the distal division (fingers of claw) and finally the greatest width. In case of two segmented tarsi, each individual segment is considered separately but both sets of measurements are kept within the same parenthesis, as in the femur. A single figure indicates length only. In the case of the genus *Chelanops* a supplementary measurement is given of the length of the femur and tibia exclusive of the pedicel as shown in text fig. 1.

Finally, these measurements, while always directly and actually comparable within the genus, are not necessarily so when comparison is made between different genera. Also allowance must be made for considerable observational

error, particularly in measurements of the coxæ and trochanters and tarsi, of small species especially. Lengths (except that of fingers and hand) are in all cases more reliable than widths.

Localities, other than type localities, are tabulated at the end of the paper.



EXPLANATION OF FIGURES

I—Femur of leg I showing method of measuring when femoral articulation is vertical; the coxa of leg I is measured as that of the palpus. IV—Leg IV showing system of leg measurement. Palpus showing method of measuring; 5' and 7' show method of making measurement of femur and tibia without the pedicel as used in Chelanops; the proportions of the palpus in all cases are: (1-2), (3-4), (5(5')-6), (7(7')-8), (9-10-11, 12).

Femur I is tabulated (5-6-7, 8). Tarsus IV would be (11-12, 13-14) as would a femur with a movable articulation.

1. *Chthonius johnstoni* J. C. Chamberlin, new species

(Plate 2, fig. 17; Plate 3, figs. 11, 12, 13.)

Female: Chelicerae as long as carapace; fingers longer than hand which is as broad as long; serrula exterior of about 18 teeth; serrula interior of a number of short teeth; flagellum of 8 simple setae (some slightly "frayed" distally); movable finger with five evenly spaced teeth along medial third of length, fixed finger with five teeth which become successively smaller posteriorly; galea entirely absent. Carapace with four pearly white eyes; almost glabrous and obscurely "ornamented" by symmetrical lighter areas; distinctly broader than long and broader

anteriorly than posteriorly, truncate anterior margin produced medially into an acute process or spine (Plate 3, fig. 11). Palpi: fingers very long and slender, twice length of hand and beset with prominent tactile setæ (Plate 2, fig. 17); claw measuring only a little shorter than chelicerae and carapace combined; coxæ "ornamented" similar to carapace. Legs: coxæ of I produced anteriorly into prominent rounded spurs; coxæ of II bearing on their inner margin a pair of remarkable combs of pinnate spines (Plate 3, figs. 12-13), femora of IV stout, less than thrice as long as greatest breadth. Abdomen, tergites entire, bearing six long simple setæ along posterior margin; genital area simple. Length 1.2 mm.

Measurements: Palpus, (11-5.5), (10.5-5.5), (24.5-5), (12-6), (37-11-25, 7). Leg I, (6-4.5), (6-5.7), (14-3, 6-2.8), (7-2), (14.8-1.8). Leg IV, (8.5-6.5), (7-6.5), (23-10-13.8), (14-3.8), (6.5-2.7, 15-2). Carapace, (19-22).

Remarks: This species is easily separable from all described North American forms by the median process of the carapace as well as by numerous other differences. It is not closely related to any species known to me. The characteristic carapacial spine is of rare occurrence in this family. The doubtful genus *Megathis* Stecker was based on this character and on the granulation of the carapace and palpi. With, (1906, p. 74) expresses doubt that these characters are really to be found in the Chthoniidae at all. That both characters are present, however, is certainly true. *Chthonius spinosus* Banks, (1893, p. 67) of which I have examined a specimen, has the palpi and carapace distinctly roughened, in general appearance, however, very different from the characteristic granulation found in the Cheliferidae and Garypidae. It is unquestionably not congeneric with typical Chthonius. It does not have the carapacial spine. *C. johnstoni* in spite of this spine, so closely resembles other species of the genus that I can see no reason, at least at present, for removing it to another genus.

This species is named for "El Botanisto", I. M. Johnston, and is dedicated to unforgettable memories of Puerto Escondido.

Habitat: In all probability the only specimen taken, was collected in a moist place under a stone (near spring) at about 1500 feet elevation.

Type: Female, No. 1266, Mus. Calif. Acad. Sci., collected by author, June 14, 1921, in Escondido Gorge, Puerto Escondido, Lower California.

2. *Ideoroncus withi* J. C. Chamberlin, new name

1905—*Ideoroncus mexicanus* Bks., With, Ann. Mag. Nat. Hist., Vol. 15, pp. 127-131, Plate IX, figs. 2a-d, Plate X, figs. 1a-f. (Misidentification.)

1906—*Ideoroncus mexicanus* Bks., With, Dan. Exp. Siam., pp. 13, 14, 16, 17, 19, 32, 41, 45, 78, 80 (Misidentification.)

With, in his excellent description of this species in 1905 (pp. 130-131), makes the following statement: "*Remarks.* I have referred the above described species to *Id. mexicanus*, Bks.; the minor points in which this species differs from Banks's description seem not to be sufficient for establishing a new species; but, on the other hand, we must admit that the description mentioned is too insufficient and lacking in important details for settling the question definitely."

Banks's typical specimen was from Sonora, Mexico, and since a species in the Gulf material agrees exactly with Banks's original description, so far as it goes, and since the species as rediscovered differs strikingly in several important respects from the species considered *mexicanus* by With, the latter has been renamed. *I. withi* is from the Windward Islands in the West Indies and the types are presumably in the collections of the British Museum.

A comparison between the two species is made in connection with *mexicanus*.

3. *Ideoroncus mexicanus* Banks

(Plate 2, fig. 13 and Plate 3, figs. 14 and 34.)

1898—*Ideoroncus mexicanus* Banks, Proc. Cal. Acad. Sci., Series III, Vol. I, p. 289.

Female: Chelicerae moderate in size; galea a long simple style (Plate 3, fig. 14); flagellum of four setae all of which are distinctly toothed along their anterior margins; serrula exterior attached, except for a very short distance at its tip, with 20 teeth; serrula interior apparently vestigial or absent, fixed finger with five teeth along distal fourth, movable finger with a row of 9 or 10 small evenly spaced teeth. Carapace much longer than broad, two distinct eyes about their diameter from anterior margin which is obtusely angled but without the usual median tooth. Palpi (Plate 2, fig. 13): Claw 3.5 times as long as greatest width, inner margin of hand greatly swollen, fingers 1.5 times as long as hand; finely and evenly granulate. Legs: Femur pars basalis of legs I and II 2.1 times as long as pars tibialis; femoral articulation of legs I and II forming freely movable joint; posterior femoral articulations vertical to long axis of femur and femoral subsegments consequently immov-

able; subterminal setæ trifid (Plate 3 fig. 34). Abdomen: tergites and sternites entire, bordered posteriorly by 8 or 9 very inconspicuous setæ; genital operculum bordered with a row of 6 small, close-set and evenly spaced setæ. Length 2.5 mm.

Measurements: Palpus, (15-10.5), (19.5-13), (45-10), (31-11), (71.5-28-45, 21.). Leg I, (12-9), (10-7), (20.5-4.5, 9.5-5.3), (15.5-3.3), (9-2.7, 13-2). Leg IV, (14-10), (14.5-7.5), (34-15-19, 13), (23.5-5), (12-3, 17-2.4). Carapace, (42-30).

Remarks: As will easily be seen in comparing the description of *mexicanus* with that of *withi*, there are numerous distinctive points of difference between the two species. Most important of these are the three setæ in the flagellum of *withi* as compared with the four of *mexicanus* and the oblique fourth femoral articulation of *withi* as contrasted with the vertical one of *mexicanus*.

Habitat: Under stones in desert arroyos; rare. Described from three specimens.

Neotype: Female, No. 1267, Mus. Calif. Acad. Sci., collected by author at Las Animas Bay, Lower California, Mexico. Originally described from a single specimen from San Miguel de Horcasitas, Sonora, Mexico, and the type deposited in the collections of the California Academy of Sciences. It was destroyed in the great fire and earthquake of 1906.

4. *Garypus giganteus* J. C. Chamberlin

1921—Chamberlin, J. C., Can. Ent. Vol. 53, pp. 186-190. Plate VII, figs. A-G.

Female: Claw strongly convex on inner margin, being thrice as long as greatest width. Tarsal joints of first legs subequal in length. Skin very distinctly reticulated having a honeycombed appearance. Tergites longitudinally divided (except last), the halves rather widely separated and comparatively small, the width of half the seventh tergite about subequal to, and not at all longer than, the fourth tarsi. Length 7 mm.

Remarks: This species was not taken on this expedition, but since it belongs to the general region under consideration and also since it is so closely related to *G. sini* n. sp., it is believed that the above short diagnosis will be helpful.

Opportunity is here taken to correct a few errors made in the original description of the species. In fig. A of the animal, the femur pars basalis is much narrower than it should be. It should appear like that of leg III. The coxæ also give an

erroneous impression and allowance should be made for them. The *fixed finger serrula* mentioned in connection with this species (and *G. californicus*) is a synonym of the serrula interior as used in this paper.

Type: Female, No. 748, Mus. Calif. Acad. Sci., collected by U. S. S. Albatross, April 20, 1906, at **Turtle Bay, Lower California**, (one specimen).

5. *Garypus sini* J. C. Chamberlin, new species

(Plate 2, fig. 20)

Female: Claw more strongly convex on inner margin than in *G. giganteus*, being only 2.5 times as long as greatest width (Plate 2, fig. 20). Legs I and II with proximal tarsal segment distinctly longest. Skin not nearly so distinctly reticulated as in *G. giganteus* although the structure is essentially identical in both species. Tergal halves larger and closer together than in *giganteus*, width of half of seventh tergite measuring distinctly longer (by one-fifth length of tarsus) than fourth tarsus. Length 6-7.5 mm.

Measurements: Palpus, (18-12), (16-10.5), (37-11.5), (43-12), (56-25-36, 23). Leg I, (10-12), (9-6), (16-4.6, 9.5-4.9), (14-3), (9-2.5, 7.2). Leg IV, (19-10), (15-7.5), (35-11.5-21.5, 7), (27-3.5), (11-3, 7.7-3). Carapace, (34 and distance between anterior eyes 14.3.) These from a specimen from San Esteban Island.

Male: Smaller than female but structurally practically the same. Genitalia small and comparatively simple. Much rarer than female, in about ratio of one or two to ten. Length 5 mm.

Measurements: Palpus, (14.4-8.2), (11.9-8), (28-8.5), (25-9), (47-21-29.5, 17). Leg I, (8.5-6.4), (7.2-5.9), (13.2-4.2, 8.1-4.2), (11.5-3), (7.2-2.5, 6.8-2.1). Leg IV, (16.1-8.2), (12.3-5.9), (28.9-8.2-20.2, 6.2), (21.6-3.4), (8.9-2.7, 8.3-2.5). Carapace, (27.1 and distance between anterior eyes, 11.5). From holotype.

Remarks: Without doubt this species is very close to *G. giganteus* and for a time it was thought that they were identical. There are, however, a number of well marked differences as may be seen from the above diagnosis. It is not at all improbable, however, that they may be eventually regarded in the light of subspecies, rather than as distinct species.

There is considerable variation in this species as regards size and proportions of the segments of the appendages and it may be possible in a close variational study of the abundant material of this species which is available, to divide it into a number of local races. For example the typical form from

Carmen Island seems to average considerably smaller than specimens from San Esteban Island.

Habitat: Under stones along rocky or sandy beaches. Usually (at least at the time we were there) found in little dome or thimble-shaped nests made of silk and covered with sand grains and small pebbles and attached to the underside of stones, pieces of drift, etc. Often many were found under a single stone. This is one of the commonest and most widespread species found in the Gulf region.

Type: Male, No. 1268, *allotype*, female, No. 1269, Mus. Calif. Acad. Sci., collected by author, May 22, 1921, at Puerto Ballandra, Carmen Island, Gulf of California.

6. *Garypus pallidus* J. C. Chamberlin, new species

(Plate 3, fig. 7)

Male: Chelicerae, small, flagellum of three well developed setae almost equal length; serrula exterior with 24 teeth, serrula interior obscure; cheliceral setae as in *G. giganteus* (Chamberlin 1921, figs. E and G, p. 187). Carapace, anterior margin distinctly emarginate; anterior eyes about one-fifth length of carapace from its anterior margin. Palpi very slender for this genus, particularly the claw which is 3.5 times as long as greatest breadth. Legs, femora pars basalis of legs I and II about 1.5 times as long as pars tibialis; femora of posterior legs slender; femoral articulation not extremely oblique to long axis. Abdomen very lightly chitinized as is carapace. In a cleared mount the tergites, except for their distal edges, and the carapace, except for anterior and lateral margins and median stripe, are so lightly chitinized as to appear translucent. Length 3 mm.

Measurements: Palpus, (25-17), (21-16), (55.3-14), (52-15), (80.4-38-44, 22). Leg I, (14-10), (12-9), (21-6.5, 13-6.5), (18.5-5), (12.2-3.6, 12.5-3.2). Leg IV, (26-13), (20-10.1), (45-14-30, 9), (34-5.5), (16-5, 14-4.5). Carapace, (47- width between anterior eyes, 19). From holotype.

Female: Very similar to male in most respects, claws of palpi slender than in male measuring about four times as long as greatest breadth (Plate 3, fig. 7). Cribriform plates as is usual, being in this species small, oval in shape, and containing about fifteen circular pores, length 3.3 mm.

Measurements: Palpus, (27-18), (23-17), (60-19), (58-17), (90-41-48, 23). Leg. I, (15-12), (13.5-10), (23-8, 15-8), (21-5.8), (13-4, 13-3.5). Leg IV, (28-15), (23-12), (53-17-36, 10.5), (39-6.5), (17-5.5, 15-4.5). Carapace, (48- distance between anterior eyes, 21). From allotype.

Remarks: This species is easily distinguished from all other Pacific Coast forms by its small size and very pale and characteristically patterned body. Like the other three western American species of this genus it belongs to the

G. floridensis group of With, i. e. those species with three setæ in the flagellum. All these four species are also characterized by a very similar genitalic structure in the males.

Habitat: Same as that of *G. sini* and collected in the same sort of nests. As a matter of fact, at the time I collected them it was thought that they were merely immature individuals of *G. sini* and so, unluckily, but few were taken; "just to establish a record!" Collected nowhere else.

Type: Male, No. 1270, *allotype*, female, No. 1271, Mus. Calif. Acad. Sci., collected by author, June 6, 1921, near Gordas Point, Ceralbo Island, Gulf of California.

7. *Olpium slevini* J. C. Chamberlin, new species

(Plate 2, figs. 15-16; Plate 3, figs. 10 and 16)

Male: Chelicerae, serrula exterior with about 22 teeth; anterior of the three flagellum setæ broader than the posterior two combined. Carapace strikingly narrowed in front of eyes (Plate 3, fig. 10), with two pairs of distinct eyes, the anterior ones twice their diameter from anterior margin of carapace and separated by a distance equal to half their diameter from posterior pair. Palpi (Plate 2, fig. 15), claw strongly swollen on inner margin; fingers remarkably long in comparison to hand; on the fixed finger, removed from its tip by about one-eighth its length, is a curious double row of short, gently swollen setæ (Plate 2, fig. 16), the number of which varies somewhat but averages about eight. Legs, tarsi characteristically spined, distal segment of tarsus IV with six pair of stout acute setæ evenly spaced along its inner margin; the outer margin with several pair of long stout distal setæ and medially with a slender and comparatively short tactile hair; coxæ of characteristic appearance (Plate 3, fig. 16). Abdomen, tergites and sternites bordered by from six to eight small setæ and with numerous lyriform fissures or "stomata"; superficially there appear to be only ten segments owing to the weak chitinization of the eleventh segment. Length 3-3.5 mm.

Measurements: Palpus, (20-13), (23-10), (46-12), (43-13.5), (74-28-48, 22.8). Leg I, (12-19), (9.5-7), (20-6, 12-6), (18-4), (11.5-2.8, 9-2). Leg IV, (14.5-12), (15-10), (39-11.5-27, 16), (30-7.5), (15.6-4.2, 12-2.5). Carapace, (42- distance between anterior eyes, 15). From specimen from South Santa Inez Island.

Female: Practically same structurally as male, apparently no distinguishing features in genital area. Claw somewhat stouter than in male, fingers 1.66 times as long as hand, claw thrice as long as greatest breadth. Length about 3.5 mm.

Measurements: Palpus, (21-13), (24-11), (44.5-18.8), (42-14), (75-29-48, 22). Leg I, (13-10), (10-8.1), (20-6, 11-5.8), (17-4), (12-2.5, 9-2). Leg IV, (19-11), (15-9), (40-12-27, 14), (31-6), (16-3.5, 12-2.3). Carapace, (45- distance between anterior eyes, 16). From allotype.

Remarks: This is easily distinguished from all North American species, except *frontalis* Banks, by its large size. From that species it differs by many characters. In *frontalis* the eyes are contiguous and the hand of the palpus is as long as the femur, while in *slevini*, the femur is much longer than hand and the eyes are distinctly separated. Described from numerous specimens.

Named for Joseph R. Slevin, "Jefe" of the expedition, who deserves the greatest of credit for the splendid success of the party.

Habitat: Under stones in desert arroyos, hillsides, etc.; nowhere really common. A fairly agile species.

Type: Male, No. 1272, *allotype*, female, No. 1273, Mus. Calif. Acad. Sci., collected by author, May 20, 1921, at **Cuesta Blanca**, (eight miles north of Loreto), **Lower California**.

Genus MINNIZA Simon

Orthotype, *M. VERMIS* Simon

This genus which has generally been regarded as a synonym of *Olpium* is here resurrected for the reception of the following two species. Through the kindness of Louis Fage of Paris I have been enabled to examine a specimen of the orthotype and there is no doubt but that these two Mexican species and *vermis* are strictly congeneric. The genotype seems to be rather closely related to *rossi* but may easily be distinguished by its trifold galea.

Chelicerae large, the distance between their posterior corners measuring almost if not quite as much as the breadth of carapace; flagellum of four setae; serrula interior lamina-form; serrula exterior distally fused; carapace almost twice as long as broad, sides subparallel, with four eyes close to anterior margin (Plate 3, fig. 9). Coxae of all legs and also palpi strikingly angular (Plate 3, fig. 17). Femoral articulations of legs I and II forming a movable joint, that of III and IV immovable and oblique to long axis of femur; distal segment of tarsus longest; arolium long, undivided and extending well beyond the simple acute claws.

8. *Minniza rossi* J. C. Chamberlin, new species

(Plate 1, fig. 5; Plate 2, fig. 11; Plate 3, figs. 9 and 17)

Male: Galea basally divided into two branches, serrula exterior with 23 or 24 teeth. Palpi moderately heavy, femur distinctly shorter than carapace, claw 3-3.3 times as long as greatest breadth. Genitalic structures distinctive (Plate 1, fig. 5). Length 2.8 mm.

Measurements: Palpus, (17.5-11), (17-9), (30-8.8), (30-11), (46.5-21-27.5, 17). Leg I, (11-9), (6-5), (12.5-4.8, 7.5-4.5), (12-3), (5.5-2, 6.5-1.3). Leg IV, (11-9), (10-6.5), (27-9-18.5, 11.5), (19.2-5), (9-2.5), 10-2). Carapace, (37.5-21). From holotype.

Female: Much the same as in male, palpi of somewhat different proportions (Plate 2, fig. 11).

Measurements: Palpus, (18-10.5), (18-9), (34-9.4), (33-12), (56-24-34.5, 17.8). Leg I, (12-10), (7-5.5), (14-5, 9-4.8), (15-3.5), (6.8-2, 7-1.8). Leg IV, (13-10), (11-7), (29-9-20, 10), (22-4.5), (11-2.8, 12-2.2). Carapace, (37-23). From allotype.

Remarks: This species is one of the commonest and most widespread of the Gulf forms. Named for Captain John Ross of the Silver Gate, to whom the expedition owes a great deal for its success.

Habitat: Under stones in dry arroyos, barren hillsides and along beaches, sometimes in company with *Garypus sini*, n. sp. This is a very active species. Described from abundant material.

Type: Male, No. 1274, *allotype*, female, No. 1275, Mus. Calif. Acad. Sci., collected by author, April 19, 1921, on San Esteban Island, Gulf of California.

9. *Minniza lindahli* J. C. Chamberlin, new species

(Plate 2, fig. 12)

Female: Serrula exterior with 17 or 18 teeth, galea as in *rossi*. Palpi (Plate 2, fig. 12), much heavier and proportionally shorter than in *rossi*, fingers about the same length as hand, claw very stout, being about 2.3 times as long as greatest breadth.

Measurements: Palpus, (14-8), (13.5-7), (24-8), (26-11), (39-21-20.5, 20). Leg I, (10-8), (5-4), (10-4, 6-4), (11-3), (4-1.5, 7-1.1). Leg IV, (11-8), (7-4.5), (22-7.5-15, 7), (17-3), (5-1.6, 8-1.6). Carapace, (31-19). From holotype.

Remarks: Described from two females. Named for John Lindahl, mate of the "Silver Gate" and entertaining comrade of a three months' cruise.

Habitat: Under stones along rocky beach.

Type: Female No. 1276, Mus. Calif. Acad. Sci., collected by author, April 25, 1921, at Tepoca Bay, Sonora.

10. *Garypinus corticolus* J. C. Chamberlin, new species

(Plate 1, fig. 2; Plate 2, fig. 1)

Male: Chelicerae with 15 serrula teeth in serrula exterior, anterior seta of flagellum very broad, nearly as broad as posterior three combined and with six or seven serrations along anterior margin, galea short and divided distally into several parts. Carapace, posterior margin of chitinization not definite, ragged edged and extending even with anterior margin of coxae IV. Palpi (Plate 2, fig. 1), fingers shorter than hand, claw 3.4 times as long as greatest width, tibia markedly reduced, shorter than hand. Legs, tarsi remarkably short and stubby, shorter than greatest width of femora, the proximal segment but little longer than broad. Coxal area slightly broadest in middle. Abdomen, vermiform, tergites posteriorly bordered by only about four setae, genitalia fairly complex and with a pair of distinct genital sacs (Plate 1, fig. 2). Length 2.5-3 mm.

Measurements: Palpus, (11.5-9), (11-6.5), (22-7.5), (20-9), (35-18-17, 10.3). From paratype from La Paz.

Female: Very similar to male; galea short; basally divided into two branches, one of which is distally forked; claw about thrice as long as wide; genital area distinctly and characteristically chitinized and with two pairs of distinct, oval, cribriform plates. Length 2.5-3 mm.

Measurements: Palpus, (11-8), (12-7), (22-8.6), (20-10.3), (37.5-19-18.5, 12.5). Leg I, (10-10), (4), (14-5-9, 6), (9.5-3.4), (3, 3.8). Leg IV, (12-8), (7-5), (24-9-16, 8.5), (15-5), (3.6-3, 5-3). From paratypes from La Paz and Guaymas.

Remarks: This species is fairly close to *G. scirianus*, n. sp., but is easily separated from it by numerous characters, especially in the genital area. In *scirianus* the tibiae of the palpi are longer than the hand while in *corticolus* they are very nearly subequal. Described from numerous specimens.

Habitat: Comparatively common under the bark of trees, particularly the little "bark flakes" of the Palo Verdes. I found one feeding on a caterpillar which was also very abundant on Palo Verde.

Type: Male, No. 1277, *allotype*, female, No. 1278, Mus. Calif. Acad. Sci., collected by author, April 12, 1921, at La Paz, Lower California.

11. *Garypinus serianus* J. C. Chamberlin, new species

(Plate 1, fig. 1; Plate 2, fig. 2, and text fig. 1)

Male: Chelicerae, serrula exterior with 16 teeth, flagellum slenderer than in preceding species, second seta longest, anterior one with two distal teeth. Carapace with posterior margin of chitinization anterior to posterior margin of coxae II. Palpi (Plate 2, fig. 2), shaped much like that of *corticulus* but more rounded posteriorly, claw 3.3 times as long as wide, fingers shorter than hand. Legs, coxal area of equal width throughout; tarsi much longer than width of femora, comparatively slender, distal segment much the longest. Abdomen somewhat stouter than in *corticulus*; tergites larger and more heavily chitinized than in *corticulus* and bordered posteriorly by about six small setae; genitalia distinctive, with a pair of well marked genital sacs (Plate 1, fig. 1). Length 2.5 mm.

Measurements: Palpus, (13-8), (15-7), (23.8-9), (24-11), (40-21-19, 13). From holotype.

Female: Very similar to male; genital area not so heavily chitinized as in *corticulus*; cribriform plates indistinct. Length 3 mm.

Measurements: Palpus, (13-9), (14-6.8), (24-8.5), (24-10.9), (40-21-19, 12). Leg I, (10-8), (4), (15-5-10, 5.2), (11.5), (3.5, 5). Leg IV, (12-8), (9-6), (25-9-16, 9), (17-5), (5, 7). From allotype.

Remarks: Most closely related to *G. corticulus* n. sp., but also comparatively close to *G. solus* n. sp. Described from ten or twelve specimens.

Habitat: Under stones on hillsides in extremely dry and hot places. One female which is doubtfully referred to this species was taken on the sea beach at Ceralbo Island in company with *Garypinus pallidus*, n. sp., and like that species was found in a small silken nidus covered externally with sand grains.

Type: Male, No. 1279, *allotype*, female, No. 1280, Mus. Calif. Acad. Sci., collected by author, July 5, 1921, on Pelican Island, Kino Bay, Gulf of California.

12. *Garypinus solus* J. C. Chamberlin, new species

(Plate 1, fig. 3; Plate 2, fig. 3)

Male: Chelicerae, serrula exterior with 19-20 teeth; flagellum setae subequal in width. Carapace extending almost even with posterior margin of coxae II. Palpi stouter than in the other two species of this group (Plate 2, fig. 3); fingers much shorter than hand; claw 2.6 times as long as greatest breadth; tibia about as long as hand. Legs, coxal area of approximately equal width throughout; tarsi much as in *serianus*. Abdomen not vermiform; tergites very weakly chitinized; genitalia dis-

tinative, apparently without the paired genital sacs (Plate 1, fig. 3). Length 2.5 mm.

Measurements: Palpus, (14-9), (14-7.5), (25-9.5), (26-13), (44-26.7-17.8, 16). From holotype.

Female: Much the same as male; apparently no distinguishing features about genital area; indistinct cribriform plates present; length 3 mm.

Measurements: Palpus, (11-7), (13-5.8), (20-8), (22-10.5), (36-22-14, 12.5). Leg I, (10-7.5), (4), (14-5-9, 5.5), (10-3), (2.5, 4). Leg IV, (10.5-13), (7.5-5.8), (23-9-13, 9), (15-5.8), (4, 6.2). From allotype.

Remarks: This species, which apparently is fairly close to the preceding two, is very easily distinguished from them by the heavier palpi and short-fingered claw. Described from eight or ten specimens.

Habitat: Under stones on hot dry hillsides. Rare.

Type: Male No. 1281, *allotype*, female, No. 1282, Mus. Calif. Acad. Sci., collected by author, May 13, 1921, on South Santa Inez, Island, Gulf of California.

13. *Garypinus litoralis* J. C. Chamberlin, new species

(Plate 1, fig. 4; Plate 2, fig. 4)

Male: Chelicerae, serrula exterior with 19 teeth; flagellum setae slender, third (?) longest. Carapace evenly and definitely rounded posteriorly reaching as far as anterior margin of coxae III. Palpi comparatively slender (Plate 2, fig. 4); fingers as long as hand; claw thrice as long as width; tibia as long as femur. Legs, tarsi slender, distal segment much the longest; tarsus IV 1.4 times as long as breadth of femur IV. Abdomen, tergites sternites and carapace smooth and "polished", heavily chitinized (the sternites less so) and dark in color; first five tergites completely divided, the next five with an anterior median notch, suggesting a partial division, eleventh entire; tergites bordered posteriorly with about 6 or 7 setae; genitalia very distinct from the three preceding species and very close to those of *G. arboricolus* n. sp. (Plate 1, fig. 4) apparently no genital sacs. Length 2.5 mm.

Measurements: Palpus, (16-11), (16-9), (32-10.3), (32-13), (53-27-27, 18.6). Leg I, (11-10), (6), (19-6-13, 6), (14.8-4), (5, 7). Leg IV, (13-10), (8.8-7), (30-10-20, 11), (22-6.5), (6.5, 9.5). Carapace, (35-distance between anterior eyes, 16). From holotype.

Remarks: This species is discussed below in connection with *G. arboricolus*, n. sp. Described from a single specimen.

Habitat: The only known specimen from under stone on beach.

Type: Male No. 1283, Mus. Calif. Acad. Sci., collected by author, May 25, 1921, at southerly end of Monserrate Island, Gulf of California.

14. *Garypinus arboricolus* J. C. Chamberlin, new species

(Plate 2, fig. 5)

Male: Chelicerae, serrula exterior with 21 teeth; flagellum setae slender, second one the largest. Carapace as in *litoralis*. Palpi stouter than in *litoralis* (Plate 2, fig. 5); claw 2.7 times as long as broad; fingers as long as hand; tibia plainly a little shorter than femur. Legs stouter than in *litoralis*; tarsus IV 1.17 times as long as greatest breadth of femur IV. Abdomen: first eight tergites completely divided; the next two partially so and the eleventh entire; tergites bordered posteriorly with about 6 setae; genitalia very similar to those of *litoralis*, the most striking difference being the presence of a well marked pair of genital sacs in this species although there are other differences. The genital sacs suggest those of *corticulus*. Length 3 mm.

Measurements: Palpus, (20-13), (20-10), (35-13), (33-15.5), (57-30-30, 21). Leg I, (15-13), (6-6), (22-8-14, 8), (15-4.5), (4, 6). Leg IV, (15-11), (12-10), (38-13-25, 15), (24-8.5), (7.5, 10). Carapace, (40-distance between eyes, 17). From holotype.

Female: Much the same as male; fingers of palpi a little shorter than hand; all tergites excepting the eleventh divided; with indistinct cribriform plates. Length 4-4.5 mm.

Measurements: Palpus, (20-12), (20-11), (36-13), (35-16), (59-33-32, 21). From allotype.

Remarks: While the resemblance between this species and *litoralis* is certainly marked, I believe the differences are too great for mere variation. Then, too, there is a difference in habitat to consider. Certainly more material of *litoralis* is desirable. Described from about 17 or 18 specimens.

Habitat: Under bark of trees, acacia, mesquite, etc.

Type: Male, No. 1284, *allotype*, female, No. 1285, Mus. Calif. Acad. Sci., collected by author, April 19, 1921, on San Esteban Island, Gulf of California.

CHELIFERIDÆ Hagen

Flagellum of four or fewer setae. Serrula exterior attached throughout its length. All tarsi single segmented. Femoral articulation of legs III and IV immovable, that of legs I and II usually of only limited movability.

As here considered the Cheliferidæ comprise four subfamilies, namely, the Cheiridiinæ Hansen, the Cheliferinæ Simon, the Sternophorinæ, new subfamily, and the Pseudocheiridiinæ, new subfamily.

PSEUDOCHIRIDIINÆ, new subfamily

This subfamily is erected for the reception of the remarkable genus *Pseudochiridium* With (1906, pp. 199-200) from the Orient. The following diagnosis is essentially that given by With for the genus.

Only ten tergites visible from above; the coxæ of the fourth pair of legs much broader than long, being produced into a posterior plate which covers the base of the abdomen together with genital area; the femoral articulation of legs I and II with the "articulate heads" of both anterior and posterior sides in middle; femoral articulation of fourth pair of legs almost perpendicular to longitudinal axis; tarsi distinctly longer than tibia.

The discovery of a species for which a new subfamily is necessary has led to the naming of a new subfamily for *Pseudochiridium* also, as, to have left the latter genus in the *Cheliferinæ*, would have brought about a most unequal arrangement of the subfamilies and would have produced groups of very unequal rank.

With foresaw that this would be necessary in 1906 (p. 200) when he wrote, "if in the future will be possible to divide the latter genus (*Chelifer*) into natural genera, it will probably be necessary to establish two new subfamilies, for the genera of the *Cheliferinæ* Sim. would in other case be of very unequal value." Since this subdivision is already accomplished, in part at least, there is no reason for leaving this genus in the *Cheliferinæ*.

STERNOPHORINÆ, new subfamily

With an oval, well marked sternum between the coxæ (Plate 3, fig. 15); all femoral articulations (Legs I-IV) perpendicular to long axis of femora and practically immovable; tarsi much shorter than tibiæ (Plate 3, fig. 6). Legs III and IV with a basal tarsal tactile hair; tibiæ with dorsal median tactile hair; chelicerae small; serrula exterior of few teeth, attached throughout its length; flagellum of four setæ; galea present.

Systematically this subfamily seems to come between the *Chiridiinæ* and the *Pseudochiridiinæ*; the legs resemble in the femoral divisions those of the *Pseudochiridiinæ* but differ strikingly in the matter of the tarsi. The entire femora of legs I and II and the tendency towards this condition in legs III and IV in the *Chiridiinæ* definitely separate these

two groups. The sternum, which is such a characteristic feature of the new subfamily, strikingly sets it off from either of these two subfamilies. The Cheiridiinae and the Garypidæ present vestiges of a sternum between the fourth coxæ, at least in some of the species, but nowhere in the Pseudoscorpionida, so far as can be discovered, is there anything which approaches in size and general distinctness the sternum which characterizes this group. In the female the presence of two pairs of very prominent cribriform plates still further distinguishes it from the Cheiridiinae.

STERNOPHORUS J. C. Chamberlin, new genus

Orthotype *S. sini* J. C. Chamberlin, n. sp.

As this is the only genus at present included in the subfamily the preceding diagnosis of the subfamily applies to the genus as well.

15. *Sternophorus sini* J. C. Chamberlin, new species

(Plate 1, fig. 6; Plate 2, fig. 21; Plate 3, figs. 6, 15, and 22-25)

Male: Chelicerae, galea short and simple; serrula exterior with 12 teeth; anterior flagellum seta broad and toothed on anterior margin, as broad as posterior three setae combined. Carapace, eyeless; obtusely angled behind, weakly chitinized, smooth. Palpi, in shape, particularly that of the claw, remarkably like that of *Garypinus corticolus* n. sp. (The two species were often taken together.) Legs (Plate 3, fig. 6), claws small and simple; empodium small not extending beyond claws; lateral subterminal setae simple. Abdomen, tergites divided longitudinally, each division bordered posteriorly by two or three minute, simple setae; genitalia distinctly different from those of any other Cheliferidae known to me (Plate 1, fig. 6).

Measurements: Palpus, (20-12), (19-12), (29-11), (25-11), (45-24-21.5, 12.3). Leg I, (12-15), (5-5), (15.5-10, 6.2), 10.5-4), (6-2.8). Leg IV, (17-10), (8-7), (25-11-14, 11), (18-6), (10-3.5). From holotype.

Female: Palpi as in male (Plate 2, fig. 21); galea short, with three distal branches; in all respects even in the measurements of the palpal segments scarcely distinguishable from male. Genital area with two pairs of very large and prominent cribriform plates (Plate 3, fig. 22), of which the anterior lateral ones are simple and oval (Plate 3, fig. 25), while the larger median ones are each armed with two large heavily chitinized spines (Plate 3, figs. 23-24).

Habitat: Under bark of Mesquite, *Sideroxylon*, Palo Tinto, etc., and often in company with other bark dwelling species. Described from numerous specimens.

Type: Male, No. 1286, *allotype*, female, No. 1287, Mus. Calif. Acad. Sci., collected by author, July 4, 1921, near Monument Point, Tiburon Island, Gulf of California.

CHELIFERINÆ Simon

Coxæ of all legs contiguous there being no trace of a sternum; coxæ of legs IV longer than broad; tarsi always shorter than tibiæ; femoral articulations of legs III and IV always at least somewhat oblique, and forming an immovable joint.

CHELIFER Geoffroy

Haplotype, *Chelifer cancroides* Linn.

This genus has formerly been considered as including a large number of species (the majority of the species of the Pseudoscorpionida being placed here) which were placed in a number of so-called subgenera. In this paper all these subgenera are considered as full genera. Two and possibly all of these genera will almost surely be subdivided still further. As the genotypes of several of these genera are insufficiently described it is impossible at present to be sure of the validity of the names as here used.

Chelifer as restricted here is synonymous with *Lophochernes* Simon, which, as shown by With (1906, p. 117), must be thrown out since it includes *Chelifer cancroides*, the type of the genus *Chelifer*. With, throughout his papers, refers to this group as the "Lophochernes" group or the group of *Chelifer cancroides*. It may be diagnosed as follows:

Males with ramshorn organs and usually but not always with coxal sacs; fore tarsi almost always curiously modified, mostly with the claws asymmetrical. Female nearly always with well defined genito-lateral setæ rows (Plate 3, fig. 33), and, so far as I can tell always with two pairs of cribriform plates. Both sexes without accessory teeth on fingers of palpi; the flagellum consisting of three setæ; all femoral articulations oblique and the posterior ones immovable; usually two real eyes. Other features which it shares in company with others are two transverse carapacial furrows and longitudinally divided tergites and sternites.

The genus is easily and naturally divided into several groups which, although hardly entitled to subgeneric rank, are at least convenient. The species here considered fall into three

such groups. In addition there is included the *cancroides* group, of which, so far as I know, *cancroides* is the only described species. (See Plate 3, fig. 31). No specimens of this species were taken, nor has it been reported from the region under consideration. The diagnostic characters of these groups are indicated in the following key:

Males

- | | |
|--|---|
| 1. With coxal spur (Plate 3, fig. 18)..... | 2 |
| Without coxal spur (Plate 3, fig. 19).....Group of <i>philipi</i> n. sp. | |
| 2. Fore tarsus with terminal spine (Plate 3, fig. 20)..... | 3 |
| Not so (Plate 3, fig. 21).....Group of <i>cancroides</i> Linn. | |
| 3. Tarsi of legs II, III and IV with bifid claws..... | |
|Group of <i>scabriculus</i> Simon. | |
| Claws simple.....Group of <i>fuscipes</i> Banks | |

Females

- | | |
|--|---|
| 1. Claws bifid..... | 2 |
| Claws simple..... | 3 |
| 2. Chelicerae with setae arrangement of Type I (Plate 3, fig. 32).... | |
|Group of <i>scabriculus</i> Simon | |
| Chelicerae of Type II (Plate 3, fig. 31)..Group of <i>cancroides</i> Linn. | |
| 3. Subterminal setae simple (Plate 3, fig. 21)..Group of <i>philipi</i> n. sp. | |
| Subterminal setae distinctly forked.....Group of <i>fuscipes</i> Banks | |

GROUP OF *C. FUSCIPES* Banks16. *Chelifera geronimoensis* J. C. Chamberlin, new species

(Plate 2, fig. 6)

Male: Chelicerae of type I; serrula exterior with 18 teeth. Carapace granulate with larger tubercles. Palpi (Plate 2, fig. 6); fingers much shorter than hand. Legs slender; subterminal setae forked. Abdomen: tergites, with ten strongly developed and prominent tergal spurs. Length 2.1 mm. From holotype.

Measurements: Palpus, (18-14), (22-12), (45-11.5), (40-14), (63-35(?)-29(?), 23).

Remarks: This dark species is related to *fuscipes* but differs in numerous characters. In *fuscipes* the chelicerae are of type II, fingers as long as hand, and there are but 8 weakly developed tergal spurs. Described from a single specimen.

Type: Male, No. 1288, Mus. Calif. Acad. Sci., collected by F. X. Williams, July 13, 1905, on San Geronimo Island, Lower California.

GROUP of *C. philipi* n. sp.17. *Chelifer philipi* J. C. Chamberlin, new species

(Plate 2, fig. 8; Plate 3, figs. 19, 21, 26)

Male: Chelicerae of type 1; serrula exterior with 18 teeth. Palpi slender. Legs: all claws simple; posterior of the asymmetrical (unlike) foreclaws with a dorsal spur; subterminal setae simple. Carapace with but few larger tubercles, and these obscure. Abdomen: tergal spurs vestigial or absent; coxal sacs absent. Length 2 mm.

Measurements: Palpus, (16-10), (19-10), (40-9), (39-11), (60-28-33, 14.4). From paratype.

Female: Palpi somewhat slenderer than in male (Plate 2, fig. 8). Genital lateral setae rows ill defined; central cribriform plates large, oval and prominent (Plate 3, fig. 26). Length 2.5 mm.

Measurements: Palpus, (17-12), (20.5-10.5), (44-9.3), (49-9.5), (63-30-34, 15). From paratype.

Remarks: This species is distinct from any others known to me and is easily distinguished from all other American forms. It is named for my brother Philip Chamberlin, companion of many of my early collecting trips. Described from numerous specimens.

Habitat: Under bark of Eucalyptus trees and stumps. Rare.

Types are in my private collection. Male and female paratypes are in the collection of the Calif. Acad. Sci.

Type locality: Stanford University Campus, California.

GROUP of *C. scabriculus* Simon

Includes besides the common *C. scabriculus*, five or six other western American species.

18. *Chelifer hubbardi* Banks

(Plate 2, fig. 10; Plate 3, fig. 33)

1901, Banks. Proc. U. S. Nat. Mus. p. 588, fig. 9.

Male: Chelicerae of type I. Carapace extremely tuberculate being covered with large lumpy tubercles as are also the first two tergites. Palpi: fingers longer than hand; claw about 3.7 times as long as broad. Legs: posterior foreclaw with a dorsal spur. Abdomen: tergites divided longitudinally by a narrow line-like suture. Length 3 mm.

Measurements: Palpus, (24-16), (29-14.8), (75.5-13), (65.5-15), (90.8-46.5-49, 27.8). Specimen from San Josef Island.

Female: Carapace very tuberculate but not so strongly so as in male. Palpi (Plate 2, fig. 10), claw 4.2 times as long as broad. Abdomen:

eighth tergite bordered by about 16 setae. Genitalia typical (Plate 3, fig. 33). Length 3.2 mm.

Measurements: Palpus, (26-16), (31-17), (85.8-14), (77-15.5), (101.51-53, 23.9). Specimen from San José Island.

Remarks: There seems to be no great variation between Gulf specimens and material from the type locality in Arizona. It seems to be somewhat closely related to *C. lativittatus*, n. sp.

Habitat: In decaying *Cereus*, decaying tubers of *Iberyllia*, etc. Often taken in company with *Chelcanops arizonensis* and *Chelifera sini*.

19. *Chelifera lativittatus* J. C. Chamberlin, new species

(Plate 2, fig. 9)

Male: Carapace as in *hubbardi* but with the tuberculations not so prominent; immediately separable from that species by the stouter palpi (Plate 2, fig. 9; claw 3.2 times as long as broad), and still more easily by the extremely broad, lightly chitinized dorsal stripe which occupies about the medial fourth of the abdomen. Tergal spurs very prominent, numbering nine; coxal sacs very large, greatly folded and wrinkled. Length 3 mm.

Measurements: Palpus, (26-18), (33-18), (89-15), (74-17), (110.4-51-55.8, 34). From holotype.

Female: Fingers very little longer than hand; claw less than thrice as long as greatest width; carapace and broad abdominal stripe as in male. Length 3.3 mm.

Measurements: Palpus, (27-19), (31-18), (82.6-15.5), (69-18), (101.7-51-53, 34). From allotype.

Remarks: Apparently most closely related to *Chelifera hubbardi* among North American species. Known only from holotype and allotype.

Type: Male, No. 1289, *allotype*, female, No. 1290, Mus. Calif. Acad. Sci., collected by J. R. Leach, at **Tapachula, Chiapas, Mexico**, at an elevation of from 2000 to 4000 feet.

20. *Chelifera sini* J. C. Chamberlin, new species

(Plate 2, fig. 7; Plate 3, figs. 18, 20 and 32)

Male: Carapace evenly granulate and with scattered larger tubercles. Palpi (Plate 2, fig. 7), claw 2.7-3 times as long as broad. Legs, anterior margin of fourth femora and inner margin of tibia with at least a few larger seta-bearing tubercles. Length, 3.5 mm.

Measurements: Palpus, (24-17), (31-16.5), (68-14.4), (61-17), (92-46-46, 28.5). Specimen from San Josef Island.

Female: Carapace as in male. Palpi, claw 2.8 times as long as broad; fingers distinctly shorter than hand. Length 4 mm.

Measurements: Palpus, (26-18), (32-18), (70-16), (61-19), (93-53-41, 33). Specimen from San Josef Island.

Remarks: This form is very closely related to *C. scabriculus* Simon, but is distinguished therefrom by its larger size, more pronounced tergal spurs in male and other characters of less importance. In all probability it must eventually be regarded as a subspecies of *scabriculus*, but in the absence of intergrading forms I prefer to regard it for the present as distinct. There seems to be some variation in this species, from locality to locality, and very probably it will eventually be possible to divide the species into a number of local races or forms, which will be based largely on quantitative measurements and proportions. Described from many specimens.

Habitat: The type material was taken under the bark of a decaying *Veachia*. In other places it was taken in decaying *Cereus* in company with *Chelifer hubbardi* and *Chelanops arizonensis*. One specimen was taken in a Termite gallery by Mr. E. P. Van Duzee and a few others were taken under bark of trees.

Type: Male No. 1291, *allotype*, female, No. 1292, Mus. Calif. Acad. Sci., collected by author, May 7, 1921, at Angeles Bay, Lower California.

Genus WITHIUS Kew

Orthotype, *W. SUBRUBER* (Simon). Cosmopolitan

Femoral articulation of legs I and II practically perpendicular to long axis of femora; fingers of palpi without accessory teeth; real eyes or ocular spots present; tarsal tactile hair never basal in position; claws simple; subterminal setae never forked; flagellum of four setae. The male is invariably distinguishable at a glance by the presence of thickly spinose median areas between the longitudinally divided sternites. The longitudinal division of the tergites often obscure. (See With, 1908, pp. 228-230, "Group of *Chelifer subruber*".)

To my knowledge this genus includes two species from North America. One of these is here described as new, the other is *W. lagunae* (Moles) of southern California (Moles,

1914, pp. 42-44, figs. 1-2), originally described as *Chelanops lagunæ*. It is very closely related to or identical with *W. subruber*, the orthotype, but in the absence of authoritatively named material of the latter species *lagunæ* has not been reduced.

21. *Withius cactorum* J. C. Chamberlin, new species

(Plate 1, fig. 7; Plate 2, fig. 14)

Male: Chelicerae with 18 teeth in serrula exterior. Carapace and tergites very heavily chitinized; two indistinct eyes. Palpi beset with numerous almost clavate setae (Plate 2, fig. 14); the row of 8 or 9 stout setae on the inner margin of femur very characteristic. Abdomen: tergites I to VI undivided, the remaining ones with a narrow median suture; sternites VIII-IX with large median setose areas; sternites III-VII with the superficial appearance of having these areas, but close examination shows them to be destitute of the characteristic setae; genitalia very simple (Plate 1, fig. 7). Length 2 mm.

Measurements: Palpus, (15-9), (15-8), (30.5-8), (26.5-9.5), (39-19-22, 13.5). From holotype.

Remarks: This species is easily distinguished from *lagunæ* by the fingers of the palpi which in *lagunæ* are distinctly shorter than the hand; also by the much simpler male genitalia of *cactorum*, and by numerous other characters. They are not at all closely related. Described from two males.

Habitat: In decaying *Cereus* in company with *Chelanops arizonensis*.

Type: Male, No. 1293, Mus. Calif. Acad. Sci., collected by author, April 18, 1921, on San Pedro Martir Island, Gulf of California.

Genus CHELANOPS Gervais

Haplotype, *C. cæcus* Gerv. Chile

This genus is termed by With in his papers of 1906 and 1908 as the "Group of *Chelifer cimicoïdes*." The following diagnosis is essentially that given by him:

Femur of legs I with wide oblique articular cavity, with posterior condyles placed near ventral margin; fingers of palps

with accessory teeth; indistinct eyes or ocular spots; tarsal tactile hair at least one-fifth removed from base. The subdivisions are those used by With in 1908.

Trachychernes or Subgroup of *Chelifer bicolor* Balzan. With, 1908, Trans. Zool. Soc. Lond., Vol. 18, p. 261.

22. *Chelanops carminis* J. C. Chamberlin, new species

(Plate 1, fig. 10; Plate 3, figs. 3, 4, 5 and 27)

Female: Palpi moderately stout (Plate 3, figs. 3-4); fingers longer than hand, evenly and finely granulate as is carapace. Legs IV remarkably slender with femoral articulation only slightly oblique (Plate 3, fig. 5); tarsal tactile hair median in position. Genital area simple (Plate 3, fig. 27). Length 3 mm.

Measurements: Palpus, (1-11), (19-9.6), (27(23)-10.8), (27(19.5)-12.5), (50-25-28, 19). From allotype.

Male: Similar to female; genitalia rather distinctive (Plate 1, fig. 10). Length 2 mm.

Measurements: Palpus, (14-10), (17-9), (25.5(22.5)-10.5), (26(19)-11.5), (47-22.5-26, 16). From holotype.

Remarks: This species is easily separable from *arizonensis* by its much smaller size; slender legs; male genitalia and by the arrangement of the sensory spots and setæ of the fingers.

Habitat: Under stones and debris along rocky beach. In company with *Garypus simi*, n. sp. and *Minniza rossi*, n. sp. A female taken from drifted sea weed by Mr. E. P. Van Duzee, at San Luis Island, differs by being considerably larger than the allotype but is identical otherwise.

Type: Male, No. 1294, *allotype*, female, No. 1295, Mus. Calif. Acad. Sci., collected by author, May 22, 1921, at Puerto Ballandra, Carmen Island, Gulf of California.

23. *Chelanops vanduzeei* J. C. Chamberlin, new species

(Plate 2, figs. 22 and 23)

Female: Chelicerae having galea short, stout and divided distally into about five short branches. Carapace suddenly depressed and constricted for its posterior half, giving the animal a peculiar and distinctive appearance; evenly and finely granulate as are the palpi. Palpi extremely heavy (Plate 2, figs. 22-23); very striking is the great *depth* of the claw which

is more than the length of fingers. Accessory teeth small and ranged in evenly spaced rows; arrangement of setae of fingers rather characteristic (fig. 23). Legs: tarsal tactile hair two-thirds length of tarsus from its base. Abdomen: tergites, excepting eleventh, divided, and, since they are rather broad, the tergal halves appear almost square; tergites bordered by about 12 simple setae. Length 5 mm.

Measurements: Palpus, (24-18), (26-15.4), (42.5(38.5)-19), (44(29.5)-21-6), (73.5-38-35 to depth, 41.5).

Remarks: This species is easily distinguished by the very heavy palpi. The genital area differs from that of the rest of the Gulf species by its simplicity; there is no centralization of the genital setae such as is usually found in members of this genus. Described from four females.

Habitat: The holotype and one paratype were beaten from *Maytenas* sp. One specimen collected on grass near spring at San Pedro Bay, Sonora. Named for Mr. E. P. Van Duzee who collected the type.

Type: Female, No. 1296, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 18, 1921, on **Coronados Island, Gulf of California.**

24. *Chelanops arizonensis* Banks

(Plate 3, figs. 8 and 30)

1901. Banks. Proc. U. S. Nat. Mus., Vol. 23, p. 589, fig. 2.

The following brief characterization of this common species is given:

Female: Carapace and palpi evenly and finely granulate. Palpi heavy; fingers a little longer than hand; tactile hairs and sensory spots distinctive (Plate 3, fig. 8); claw about 2.4 times as long as width. Legs slender but not so much so as in *carminis*; tactile hair of tarsus IV median in position. Genital area much resembling that of *carminis* (Plate 3, fig. 30). Length 4.5-5 mm.

Measurements: Palpus, (30-26), (36-23), (61(51)-24), (60(47)-26), (104-50-56, width, 42). Specimen from Tortuga Island.

Male: Similar to female; palpi considerably stouter, especially the hand. Genitalia differing considerably from *carminis* although superficially suggesting them. Length 4-4.5 mm.

Measurements: Palpus, (29-24), (35-22), (60(51)-23), (55(42)-26.5), (100-48-57 to depth, 50.5). Specimen from Tortuga Island.

Habitat: In decaying *Cereus*, *Echinocactus* and similar moist places. Often abundant and usually found in the moister parts of the decay. Often taken in company with other species. It was found in company with *Chelififer sini*, *Chelififer hubbardi* and *Withius cactorum*.

Lamprochernes or Subgroup of *Chelififer argentinus* Thor. With, 1908, Trans. Zool. Soc. Lond., Vol. 18, pp. 289-291.

25. *Chelanops ariditatis* J. C. Chamberlin, new species

(Plate 1, fig. 8; Plate 3, figs. 1, 2 and 28)

Female: Carapace almost smooth. Palpi finely granulate; moderately stout (Plate 3, fig. 1); arrangement of tactile hairs and accessory teeth distinctive (Plate 3, fig. 2); fingers shorter than hand. Legs: tarsal tactile hair one-fifth removed from base. Abdomen: tergites lightly chitinized, bearing about 16 setae along posterior border; genital area with curious and distinctive arrangement of setose patches (Plate 3, fig. 28). Length 4 mm.

Measurements: Palpus, (23-17), (24-14), (39(35)-19), (42(30.5)-21.2), (70-38-34, 29). From allotype.

Male: About same as female; genitalia distinctive (Plate 1, fig. 8). Fingers as long as hand. Length 3-3.2 mm.

Measurements: Palpus, (21-15), (20-12.5), (37(33)-19), (38(28)-20.9), (62-32.5-32.5, 28.5). From holotype.

Remarks: This species is most easily recognized in both sexes by the genital area. Described from numerous specimens.

Habitat: Under bark of Mesquite and trees of similar habit. Often in company with other species. Not uncommon.

Type: Male, No. 1297, *allotype*, female, No. 1298, Mus. Calif. Acad. Sci., collected by author, May 8, 1921, at Las Animas Bay, Lower California.

Subgroup of *CHELIFER RUDIS* Balzan (With, III a.)

With, 1908, Proc. Zool. Soc. Lond., Vol. 18, pp. 253, 254.

The following species is doubtfully referred to this subgroup. Certainly it does not belong to any of the other three. The only point in which it seems to agree with *C. rudis* is in the presence of a flagellum consisting of four slender setae. The chances are that it really should be placed in a new group.

26. *Chelanops vastitatis* J. C. Chamberlin, new species

(Plate 1, fig. 9; Plate 2, figs. 18, 19; Plate 3, fig. 29)

Male: Carapace: legs and palpi evenly and finely granulate and beset with stout, almost clavate setæ. Palpi heavy (Plate 2, figs. 18-19); arrangement of tactile hairs and accessory teeth distinctive; hand almost as deep as length of fingers. Legs with tarsal tactile hair 0.65 of tarsal length removed from base. Abdomen, tergite halves narrowly rectangular, being four times as wide as long; tergites bordered posteriorly by about 14 stout serrately clavate setæ; genital area distinctive (Plate 1, fig. 9). Length 3.2 mm.

Measurements: Palpus, (25-21), (26-18), (46(40)-21), (45(33)-23.5), (78-43-41, to *depth*, 40). From holotype.

Female: Similar to male. Palpi not so heavy; shape of hand somewhat different, being broadest near base; claw 2.5 times as long as broad. Genital area distinctive (Plate 3, fig. 29); the anterior margin of the central spinous area varies somewhat in shape. Length 4-4.2 mm.

Measurements: Palpus, (27-25), (28-19), (51(45)-23.3), (51(37.5)-26), (85-47.5-41, to *breadth*, 33.6). From allotype.

Remarks: This species is easily separated from all other Gulf *Chelanops* by numerous characters, such as the genital area, palpi, etc. It is closely related to an unidentified species from Okefinokee Swamp, Georgia.

Habitat: Under bark of Mesquites and trees of similar habit; often in company with other bark dwelling species. Common in places.

Type: Male, No. 1299, *allotype*, female, No. 1300, Mus. Calif. Acad. Sci., collected by author, July 4, 1921, near Monument Point, Tiburon Island, Gulf of California.

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- 1908—With, *Trans. Zool. Soc. London*, Vol. 18, pp. 217-340. Pl. XXIX-XXXI.

EXPLANATION OF PLATES

Plate I¹

Male genitalia

1. *Garypinus serianus*; 2. *Garypinus corticalus*; 3. *Garypinus solus*; 4. *Garypinus litoralis*; 5. *Minniza rossi*; 6. *Sternophorus sini*; 7. *Withius cactorum*; 8. *Chelanoops (Lamprochernes) ariditatis*; 9. *Chelanoops (Group IIIa (With)?) vastitatis*; 10. *Chelanoops (Trachychernes) carminis*.

Figures 1 and 10 are "composites" of the holotype and a paratype. Figure 3, is from a paratype from Palm Cañon, Angel de la Guardia Island. All the rest are from the holotypes.

Plate II¹

Palpi

1. *Garypinus corticalus*, ♂ paratype; 2. *Garypinus serianus*, ♂; 3. *Garypinus solus*, ♂; 4. *Garypinus litoralis*, ♂; 5. *Garypinus arboricolus*, ♂; 6. *Chelifer geronimoensis*, ♂; 7. *Chelifer sini*, ♂; 8. *Chelifer philipi*, ♀ paratype; 9. *Chelifer lativittatis*, ♂; 10. *Chelifer hubbardi* (Banks), ♀ paratype (Coll. Mus. Comp. Zool.); 11. *Minniza rossi*, ♀ paratype; 12. *Minniza lindahli*, ♀ paratype; 13. *Ideoroncus mexicanus* (Banks), ♀ neotype; 14. *Withius cactorum*, ♂; 15. *Olpium slevini*, ♂ paratype, Coronados Island; 16. Same, clubbed sensory setæ at tip of movable finger; 17. *Chthonius johnstoni*, ♀ (Adult ?); 18. 19. *Chelanoops (Group IIIa (With)?) vastitatis*, ♂; 20. *Garypus sini*, ♀ paratype, San Esteban Island; 21. *Sternophorus sini*, ♀ paratype, Espiritu Santo Island; 22. 23. *Chelanoops (Trachychernes) vanduzeei*, ♀ paratype.

Unless otherwise noted all above figures are from the holotypes. When drawing is from a paratype and no locality given, the paratype is from the type locality.

Plate III¹

1. *Chelanoops (Lamprochernes) ariditatis*, ♀ palpus; 2. Same, ♀ paratype, fixed finger; 3. *Chelanoops (Trachychernes) carminis*, ♀ paratype, San Luis Island; 4. Same, ♀, fingers; 5. Same, ♀ paratype, San Luis Island, Leg IV; 6. *Sternophorus sini*, ♀ paratype, Espiritu Santo Island, Leg. IV; 7. *Garypus pallidus*, ♀ paratype, palpus; 8. *Chelanoops (Trachychernes) arizonensis* (Banks), ♀, fingers of palpus, Tortuga Island; 9.

¹ These plate numbers (I, II, and III) refer only to the plates in this paper.

Minniza rossi, ♀ paratype, anterior margin of carapace; 10. *Olpium strevini*, ♂ paratype, South Santa Inez Island, anterior margin of carapace; 11, 12, 13. *Chthonius johnstoni*, ♀; 11. Anterior margin of carapace; 12. Coxæ I and II; 13. Pinnate coxal spines; 14. *Idcoroncus mexicanus* (Banks), ♀ neotype, spinniret; 15. *Sternophorus sini*, ♀ paratype, Espiritu Santo Island, coxæ and sternum; 16. *Olpium strevini*, ♂ paratype, South Santa Inez Island, coxæ; 17. *Minniza rossi*, ♀ paratype, coxæ; 18. Coxa IV of *Chelifer sini*, showing coxal spur and sac, ♂; 19. Coxa IV of *Chelifer philipi*, showing absence of coxal spur and sac, ♂ paratype; 20. Tip of tarsus I of *Chelifer sini*, showing tarsal spine and bifid subterminal setæ, ♂; 21. Tip of tarsus I of *Chelifer philipi*, showing absence of tarsal spine and simple subterminal setæ, ♂ paratype; 22. *Sternophorus sini*, ♀ genital area; 23, 24, 25. *Sternophorus sini*, ♀; 23. Ventral aspect of spined cribriform plate; 24. Lateral aspect of same. 25. Simple (secondary) cribriform plate. ♀; 26. *Chelifer philipi*, ♀ paratype, large or primary pair of cribriform plates; 27. *Chelanops (Trachychernes) carminis*, ♀ paratype, San Luis Island, genital area; 28. *Chelanops (Lamprochernes) ariditatis*, ♀ genital area; 29. *Chelanops (Group IIIa (With)?) vastitatis*, ♀ genital area; 30. *Chelanops (Trochychernes) arizonensis* (Banks) ♀, San Pedro Martir Island, genital area; 31. Chelicerae of Type II, showing reduction in the number of dorsal setæ. (*Chelifer caneroides* (Linn.) ♀, Salt Lake City, Utah); 32. Chelicerae of Type I, showing normal number of dorsal setæ. (*Chelifer sini*, ♂); 33. *Chelifer hubbardi* (Banks), ♀ genital area, paratype. (Coll. Mus. Comp. Zool.); 34. *Idcoroncus mexicanus* (Banks) ♀ neotype. Subterminal seta.

Figures drawn from the holotype are indicated by the male sex sign, ♂. Figures from the allotype are indicated by the female sex sign, ♀. Figures from paratypes from type locality are listed without localities.

PLATE I

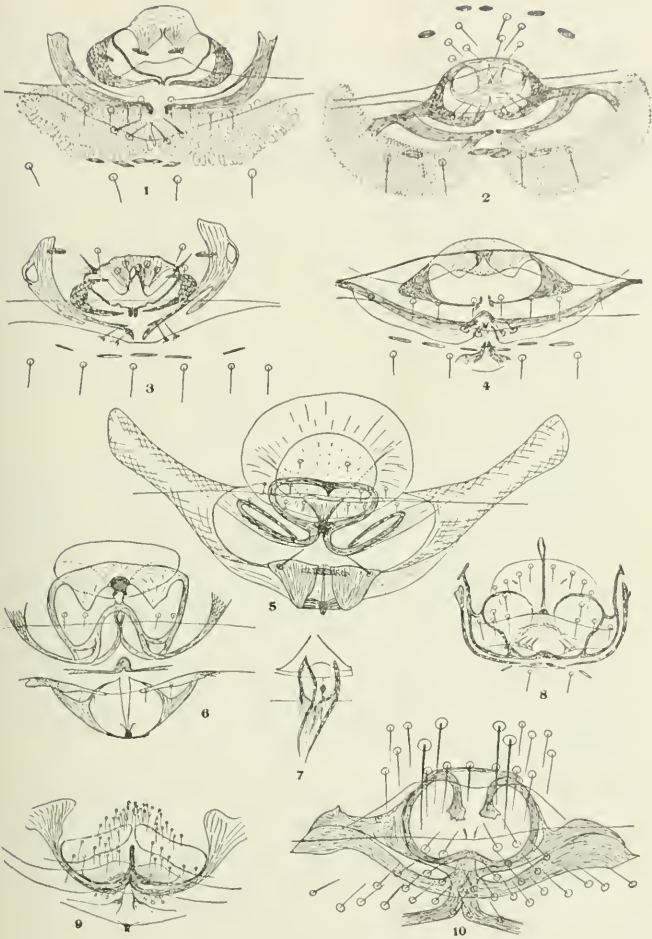


PLATE II

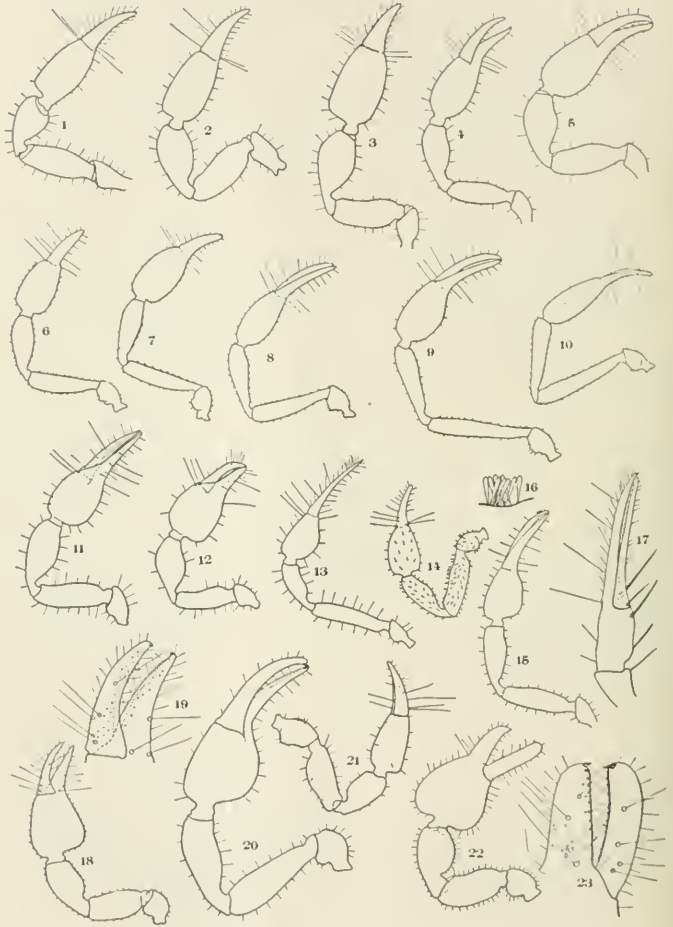
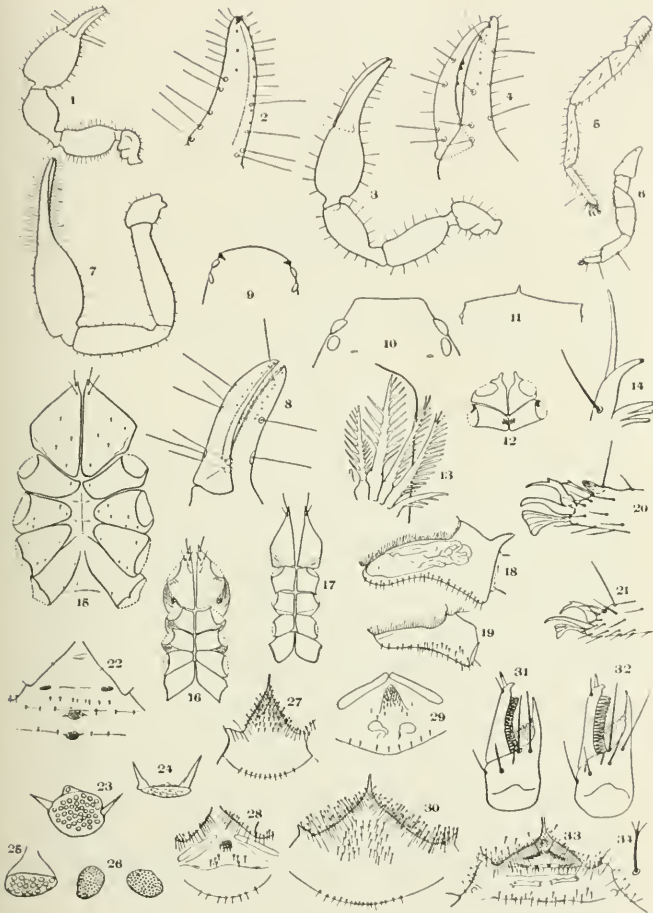


PLATE III





PROCEEDINGS
OF THE
CALIFORNIA ACADEMY OF SCIENCES
FOURTH SERIES

VOL. XII, No. 18, pp. 389-407, text figures 1 to 47 July 21, 1923

XVIII

EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921

ON CHILOPODS AND DIPLOPODS FROM ISLANDS
IN THE GULF OF CALIFORNIA¹

BY

RALPH V. CHAMBERLIN

It is a matter of considerable interest to be able to publish the following list since, heretofore, nothing has been known of the myriopod fauna of islands of the Gulf of California, and only a few isolated records have been made for Lower California proper. The present paper records a total of 16 species, nine chilopods and seven diplopods, collected by the Expedition of the California Academy of Sciences from April to July, 1921. Of these, 12 species were taken on the islands only, three species at neighboring places on the peninsula or mainland, and one, the abundant *Scolopendra polymorpha*, on both islands and mainland at nearly every station where myriopods were collected. Unless otherwise stated under the species concerned, all specimens were collected by Joseph C. Chamberlin, and references to field notes are to those of his journal.

Most of the forms represented in this collection, of which the majority are new, form an obvious continuation of the Sonoran fauna as known in Arizona and southern California;

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

July 21, 1923

but a few are of distinctly tropical genera. Among the chilopods, two species belong to the tropical genus *Pectiniunguis*, the genotype of which was also described from the cape region of Lower California. One species of diplopod taken at San Pedro Bay, Sonora, is of the tropical genus *Siphonophora*, while two species belong to the similarly tropical genus *Orthoporus*, one of these also coming from the coastal strip of Sonora, and one from Tiburon Island. The new cryptodesmid genus *Xerodesmus*, the type of which was taken at Mulegé on the peninsula, also apparently has its nearest affinities with tropical forms.

CHILOPODA

SCOLOPENDRIDÆ

1. *Scolopendra polymoryha* Wood

Proc. Acad. Nat. Sci. Phila., 1861, p. 11

Localities. Arizona: Nogales, one specimen, April 4, E. P. Van Duzee; Sonora: Guaymas, two specimens, E. P. Van Duzee, Apr. 7, and J. C. Chamberlin, Apr. 14; Tepoca Bay, two specimens, Apr. 25. Lower California: Ensenada de Todos Santos, three young, Apr. 7; Puerto Escondido, one specimen, June 4; San Pedro Nolasco Island, one specimen, E. P. Van Duzee, Apr. 17; San Esteban Island, two specimens, Apr. 20; Georges Island, four specimens, Apr. 26; Angela de la Guardia Island, one specimen, May 3. Sal si Puedes Island, one specimen, May 9; San Lorenzo Island, one specimen, May 9; Tortuga Island, two specimens, May 11; Santa Inez Island, two specimens, May 13; Ildefonso Island, one specimen, May 17; Coronados Island, one very young, May 18; Carmen Island, Puerto Ballandra, one specimen, May 21; Monserrate Island, three specimens taken by Virgil Owen and J. C. Chamberlin, May 25; Espiritu Santo Island; Isla Partida, two specimens, May 30 and June 25; El Candeleros Bay, one specimen, June 8; Ballena Island, three specimens, June 9; Tiburon Island, one specimen, July 5.

SCHENDYLIDÆ

Genus PECTINIUNGUIS Bollman

Proc. U. S. Nat. Mus. 1889, XII, p. 212

Adenoschendyla Brölemann & Ribaut, Bull. Soc. Ent. France, 1911, p. 192; and Nouv. Arch. Mus. Hist. Nat., 1912, ser. 5, 4, p. 104.

Non *Pectiniunguis* Brölemann & Ribaut, Nouv. Arch. Mus. Hist. Nat. ser. 5, 4, p. 98.

In assuming that *Pectiniunguis americanus* Bollman, type of the genus, agrees with *P. insulanus* Brölemann and Ribaut in having a labrum lacking truly differentiated teeth on the median arc, Brölemann and Ribaut (loc. cit. supra) have apparently fallen into error. Well developed teeth are present. In consequence their diagnoses of *Pectiniunguis* and *Adenoschendyla* must be interchanged. This makes *Adenoschendyla* a synonym of the former name and leaves the group typified by *insulanus* without designation. It may be known as **Litoschendyla**, nom. nov. *P. americanus* Bollman was described from a male taken at Pichilingue Bay, the specimen being subsequently dissected and redescribed by Cook (Proc. U. S. Nat. Mus. 1890, p. 388). Two new species closely related to the genotype and taken on islands of the Gulf of California are listed below. Other species of the genus are known from the West Indies, South America, the Galapagos Islands and the Fiji Islands.

2. *Pectiniunguis nesiotus* Chamberlin, new species

General form of head and prehensors as in *P. americanus* with the prebasal plate similarly exposed. Prelabral region distinctly separated from pleural region on each side by a clear band; twice as wide as long or nearly so; reticulation distinct throughout, the reticulation finer in a median longitudinal band which expands on each side in front of the middle; a pair of postantennal setæ as usual, a second pair closer together in front of the middle and ectad of each of these a transverse series of five or six setæ. Teeth of median arc of labrum strongly chitinized, stout, 14 in number in the type. Teeth or pectinations on each side of these also stout, becoming more slender in going ectad, nine or 10 in number, (Cf. fig. 1). Dentate lamella of each mandible divided into four parts, toothed as follows: 3, 5, 2, 1. Dorsum deeply bisulcate, smooth. In the eupleurium the posterior sclerite of the fourth series (4y) is present as are also the anterior ones

of series four and five (4x and 5x). Ventral pore not present on first and penult plates. Pairs of legs fifty-nine in both male and female types. Length, 46 mm.

Type: Male, No. 1247, and *allotype*, female, No. 1248, Mus. Calif. Acad. Sci., collected April 20, 1921 by Jos. C. Chamberlin on **San Esteban Island, Gulf of California**.

This species is different from others thus far known in the formula of teeth of mandible. It differs from *americanus* in this formula as well as in lacking pores on the penult sternite, the dentition of labrum, and in the presence of pleurite 4 y. In neither the types of this nor the following species is there a geminate dark dorsal stripe.

3. *Pectiniunguis amphibius* Chamberlin, new species

General form of head and prehensors also as in *americanus*. The prebasal plate usually exposed, but sometimes covered, the cephalic plate shifting over the anterior border of the basal plate. Prelabral region set off distinctly from the pleural regions; depressed transversely in front of the labrum, the latter protruding prominently in the types, with its median edge directed ventrad.* Median arc of labrum deep, characteristically straight at bottom. In the male examined the teeth on this straight median part of edge are eight in number, but in a female dissected there are only four. These four teeth, however, are broad and obviously double, as though formed by the nearly complete fusion of the teeth in pairs. See further fig. 2. Dentate lamella of mandible in three divisions: the teeth thus, 3, 3, 3. Dorsum and pleurites as in *nesiotus*. Ventral pores present on all plates from first to penult inclusive, the pores 20 or more in number on the latter. Number of pairs of legs in the male 61; in the female usually 63; occasionally 61 as in the male. Length to about 65 mm.

Localities. **Danzante Island**, nine females and three males. **Carmen Island**, two females.

Type: Male, No. 1249, and *allotype*, female, No. 1250, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, May 25, 1921 on **Danzante Island, Gulf of California**.

This species seems very close to *P. americanus*, but, according to Cook's figures of the latter, differs in the presence of pleurite 4 y. The pores of the penult sternite are notably more numerous, and the teeth of the dentate lamella of mandible are 3, 3, 3, instead of 3, 3, 2. It differs from *nesiotus* in the

* In *P. albemarlensis* Chamb., and, at least sometimes, in *P. knigei* Chamb., the labral region bulges somewhat similarly but the edge of the labrum at middle is not turned ventrad in any specimens observed. In these species the median arc is deeply angular. (Cf. figs. 3 and 4.)

presence of ventral pores on first and penult sternites, in the divisions of the dental plate of the mandibles, etc.

The field note records that this species was taken below the high-tide mark. Its habits would thus seem to be similar to those of the related *Hydroschendyla submarina* (Grube) of the coasts of England, France and Bermuda Islands.*

Genus NYCTUNGUIS Chamberlin

Bull. Mus. Comp. Zool., 1914, LVIII, p. 201

A genus previously known from several forms occurring in California. The species of this genus are readily distinguished from those of *Schendylurus* and *Pectiniunguis* in the possession of normally developed claws on the anal legs, and from the latter in having the coxal glands simple or homogeneous.

4. *Nyctunguis mirus* Chamberlin, new species

The general form of the head is shown in fig. 5. The type, as shown by this figure, is interesting in having the one antenna present composed of only nine articles, all of which are long, probably being regenerated. Prebasal plate not exposed in the type. Basal plate about 3.7 times wider than long. Prehensors when closed not attaining anterior margin of head; inner edge of femuroid short; all articles unarmed as usual. Prosternum 1.6 times wider than long. (Cf. fig. 6). Labrum with median arc not deep, its teeth 16 in number, of which all but the more lateral ones are distally blunt. Four or five teeth or pectinations of the usual character on each side (fig. 8). Dentate lamella of mandible quadripartite, the teeth 3, 3, 5, 1 (fig. 7). Ventral pores in a large area which is usually transversely elliptic or quadrate with two angles on median line, the area somewhat concavely depressed. Last ventral plate broad and trapeziform, sides straight or nearly so, caudal corners not rounded (fig. 10). Coxal pores covered by plate, or the posterior one but slightly exposed. Last legs in the female slender, the claw normal. Pairs of legs, female type, fifty-nine. Length, about 38 mm.

A small male taken at the same locality and time is also referred to this species because of the close agreement in structure of the dentate lamella of mandible. The head differs in form, as shown in fig. 11. The antennæ have the normal fourteen articles. The labrum is more deeply arched and the

*Cf. R. V. Chamberlin, The Myriopod Fauna of the Bermuda Islands, Ann. Ent. Soc. America, 1920, XIII, p. 278.

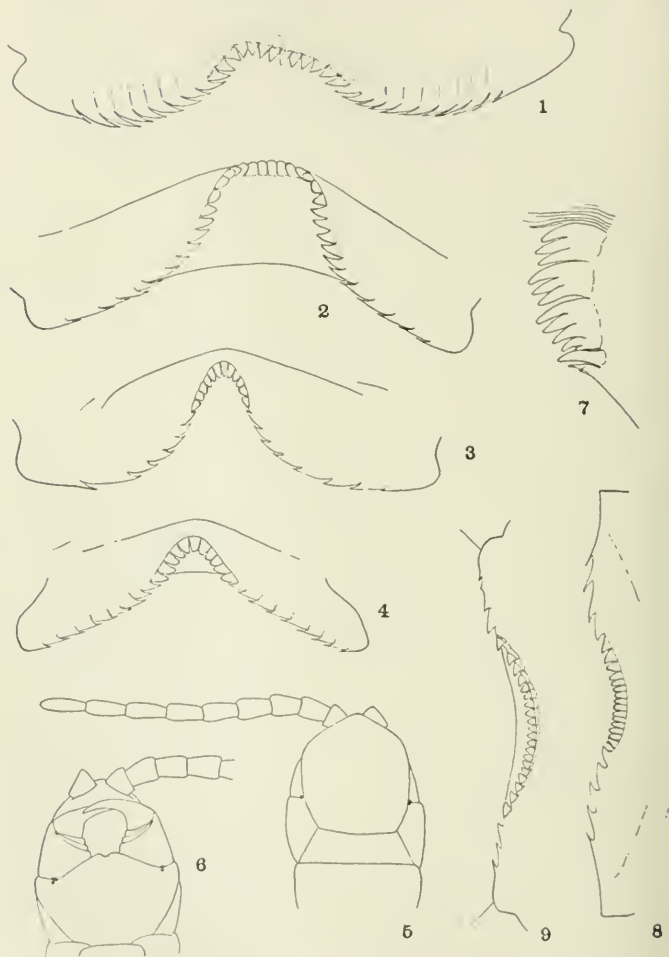


Fig. 1. Labrum of *Pectiniunguis nesiotetes*, sp. nov., x 182; 2. Labrum of *Pectiniunguis amphibius*, sp. nov., x 182; 3. Labrum of *Pectiniunguis albemarlensis* Chamberlin, type, x 182; 4. Labrum of *Pectiniunguis gaigei* (Chamberlin), x 175; 5. Anterior end of body of *Nyctunguis mirus*, sp. nov., dorsal view, type, x 20; 6. The same, ventral view, x 20; 7. Dentate lamella of mandible of same, type, x 375; 8. Labrum of same, type, x 182; 9. Labrum of *Nyctunguis libercolens*, sp. nov., x 480.

median teeth are directed ventrad; they are twelve in number instead of sixteen, and are conically pointed. The femuroid of prehensors with inner side longer and the prosternum proportionately also longer. The last ventral plate is proportionately longer. Anal legs with joints clothed beneath with numerous fine, short hairs, as in the males of other species of the genus, and the claw small but distinct.

Type: Female, No. 1251, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, April 7, 1921, at **Ensenada de Todos Santos, Lower California.**

5. *Nyctunguis danzantinus* Chamberlin, new species

Cephalic plate only slightly longer than wide (15:14); anterior margin broad, only weakly convex, the caudal margin straight; broadest a little in front of middle. Prebasal plate exposed. Claws of prehensors when closed reaching nearly to end of first antennal article. Prosternum and joints of prehensors all unarmed. Labrum separated only at ends as usual. Deeply excavated at middle, the median arc 10 teeth, of which six or seven are directed ventrad, on each side four teeth, the ectal portion of edge smooth (fig. 13). Teeth of dentate lamella of mandible 3, 3, 3 (fig. 14). Dorsum deeply bisulcate, otherwise smooth. Coxal pits two on each side and homogeneous as usual, partly covered by last ventral plate. Last ventral plate broad, trapeziform. Anal legs in female long, not crassate, the claw normally developed. Pairs of legs, 55. Length, about 27 mm.

Type: Female, No. 1252, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, May 24, 1921, at **Danzante Island, Gulf of California.**

6. *Nyctunguis libercolens* Chamberlin, new species

Body conspicuously attenuated from middle toward both ends. Yellow in color, with the head and often also the anal legs orange. A geminate, dark, dorsal stripe, lengthwise of body, sometimes also present. The general shape and proportions of the head as shown in fig. 12. Prebasal plate normally exposed, but sometimes covered. Claws of prehensors when closed attaining or sometimes a very little surpassing the anterior margin of head. Median arc of labrum wide, only moderately curved, and bearing from 14 to 20 teeth, with pectinations on each side as usual (fig. 9). Dentate lamella of mandible tripartite, the teeth 3, 3, 4. Ventral pores on anterior plates in the usual subcircular areas. Last ventral plate broad and trapeziform. Coxal pores as usual. Anal legs in female slender; in the male moderately swollen, the tarsal joints, especially the second one, more slender, the joints clothed below as usual. Pairs of legs 47 or 49 in all specimens examined, the males normally having the lesser number. Length, to 30 mm.

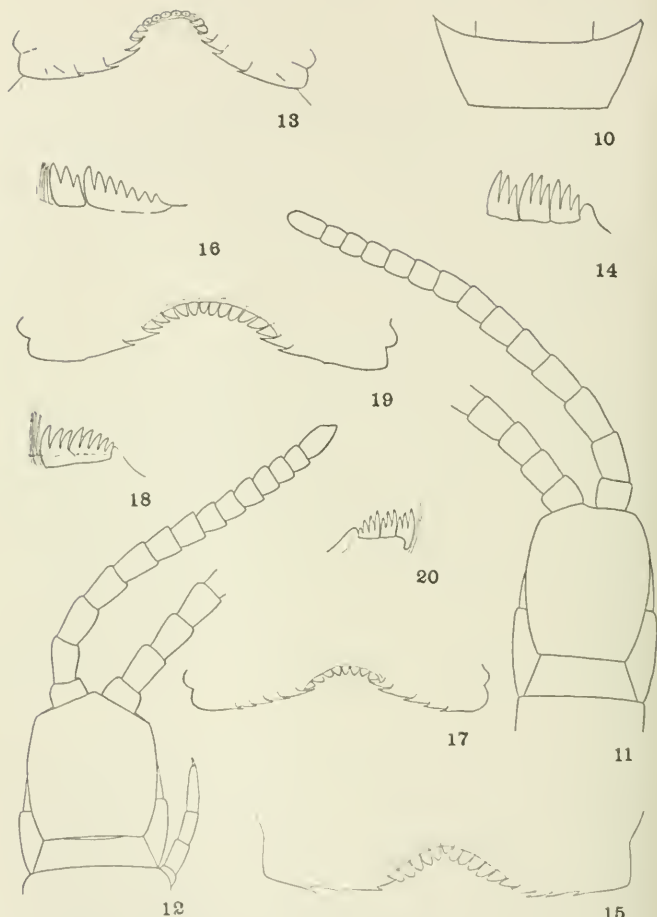


Fig. 10. Last ventral plate of *Nyctunguis mirus*, sp. nov., type, x 75; 11. Same, dorsal view of anterior end of a young male, x 46; 12. Anterior end, dorsal view, of *Nyctunguis libercolens*, sp. nov., x 49; 13. Labrum of *Nyctunguis danzantinus*, sp. nov., x 235; 14. Dentate lamella of mandible of same, x 375; 15. Labrum of *Nyctunguis montercus* (Chamberlin), paratype, Pacific Grove, x 240; 16. Dentate lamella of same, paratype, Pacific Grove, x 375; 17. Labrum of *Nyctunguis heathi* (Chamberlin), type, x 230; 18. Dentate lamella of mandible of same, type, x 375; 19. Labrum of *Nyctunguis catalina* (Chamberlin), type, Catalina Id., x 375; 20. Dentate lamella of mandible of same, type, x 375.

Localities. California: Stanford and environs, numerous specimens taken under the bark of Eucalyptus trees in Dec., 1920; Los Angeles, author's collection, 1909, etc.

NESONYX Chamberlin, new genus

Like *Nyctunguis* in having the anal legs armed with normal claws, but differing in wholly lacking coxal glands. Labrum well developed, discrete excepting at middle where continuous with prelabral region. Median arc dentate, the teeth distinct, typically slender, with lateral teeth or pectinations more finely tipped as in related genera. Claws of second maxillæ pectinate along both margins; internal angle of pleurite not prolonged forward. Genotype. *N. flagellans* Chamberlin, new species.

7. *Nesonyx flagellans* Chamberlin, new species

Head but little longer than wide (cir. 15:14); sides convex, widest in front of middle; caudal margin wide, straight. Antennæ filiform; the ultimate article longer than the two preceding ones taken together, the sensory cone areas or depressions proximad of distal end. Prebasal plate not exposed (Cf. fig. 21). Teeth of median region of labrum long and slenderly conical, becoming more acute in passing ectad on each side. Total number of teeth about 24, of which 15 pertain to the median arc, all teeth rather pale in the type (Cf. fig. 22). Dentate lamella of mandible tripartite, the teeth 3, 3, 3 (2), long, pale. Inner branch of first maxilla comparatively small, conical, not set off by suture; outer branch stout, lappets long and slender, lying more or less in dorsal position. Prehensors with claws, when closed, much exceeded by chepalic plate; rather weak, the claws slender; all joints unarmed. Prosternum without chitinous lines. Basal plate as shown in fig. 21. Ventral pores on anterior sternites; on each of these, where present, in a small, depressed, circular area, few in number. Dorsal plates deeply bisulcate. Last ventral plate very wide, its sides strongly converging caudad; a band of short, fine hairs across its caudal border. Anal legs of male moderately thickened, ending in normal claws, the ventral surface densely clothed with fine, short hairs; those of the female more slender, the short hairs beneath restricted to proximal joints. Number of pairs of legs, in both male and female types, fifty-five. Length, about 26 mm.

Georges Island, one male and one female taken under stones, Apr. 20.

The field note states that these animals when disturbed thresh about, this habit suggesting that of species of *Balophilus*.

Type: Male, No. 1253, *allotype*, female, No. 1254, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, April 20, 1921, on Georges Island, Gulf of California.

HIMANTARIIDÆ

GOSOTHRIX Chamberlin, new genus

No suprascutella above the spiraculiferous pleurites. Dorsal plates not sulcate. Ventral plates without pores or special impressions. Chitinous lines present in prosternum, complete. Last ventral plate moderate, quadrate. Coxal pores few; opening at edge of last ventral plate, typically in a common slit or furrow.

Genotype, *G. insulanus* Chamberlin, new species.

Differs from *Gosiphilus*, represented by several species in California, in the absence of ventral pores and the presence of claws on the anal legs. Distinguished from *Notobius* in the absence of ventral pores and of suprascutella.

8. *Gosothrix insulanus* Chamberlin, new species

Antennæ flattened and contiguous at base, attenuated distad, the ultimate article with sensory pits proximad of distal end. Head small, narrowed forward from behind the middle, the anterior and posterior margins truncate. Basal plate across its caudal border wider than the head, long. Prebasal plate exposed (Cf. fig. 23). Prehensors small, the claws when closed equalling or slightly surpassing the anterior margin of head. The prosternum unusually long, the chitinous lines strongly developed and complete (Cf. fig. 24). Dorsal plate not sulcate, smooth, or very finely longitudinally striate and of a consequent somewhat silky luster. No ventral pores detected. Coxal glands five or six on each side, of which only two are exposed at edge of last sternite, the others being covered and partly crowded against penultimate pediferous segment and becoming obvious only after clearing and mounting of specimen, the glands apparently opening into a channel along edge of last ventral plate. Last sternite quadrate, the sides being essentially parallel and the caudal margin straight. Anal legs with slender claws. Number of pairs of legs in the type, a female, one hundred and fifty-nine. Length, about 86 mm.

Type: Female, No. 1255, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, July 1, 1921 at Pond Island, Gulf of California.

GOSIBIDÆ

9. *Gosibius paucidens* (Wood)

Lithobius paucidens Wood, Jour. Acad. Nat. Sci. Phila., 1862, n. s. V, p. 14.

Gosibius paucidens Chamberlin, Can. Ent., 1912, 43, p. 204; Bull. Mus. Comp. Zool., 1917, LVII, p. 210, pl. 1, fig. 1-4.

Lower California: Ensenada de Todos Santos, three males, Apr. 7. A common species in southern California.

SCUTIGERIDÆ

10. *Scutigera coleoptrata* (Linnæus)

Scolopendra coleoptrata Linnæus, Syst. Nat. ed. 10, I, p. 537, 1758.

Scutigera colcoptrata Lamarck, Syst. Anim. s. vert., 1801, p. 182.

Scutigera coleoptrata Latzel, Myriop. Ost.-Ung. Mon., 1, 1880, p. 24, pl. 1, figs. 1-7, which see for full early European bibliography.

Selista forceps Rafinesque, Ann. Nat., 1820, p. 7.

Cermatia colcoptrata Say, Jour. Acad. Sci. Phila., 1921, II, p. 5.

Cermatia colcoptrata var. *floridensis* Newport, Ann. and Mag. Nat. Hist., 1844, XIII, p. 95.

Cermatia floridana Newport, Trans. Linn. Soc., London, 1845, 19, p. 353.

Cermatia forceps, Wood, Trans. Amer. Phil. Soc., 1865, XIII, p. 145, pl. 3, figs. 1, 1a.

Scutigera colcoptrata Chamberlin, Ann. Ent. Soc. Amer., 1920, XIII, p. 283.

Localities. Raza Island, a very young taken Apr. 21; Georges Island, one partly grown, Apr. 26; Espiritu Santo Island, a very young taken May 31; San Pedro Bay, Sonora, one specimen, July 7.

DIPLOPODA

POLYXENIDÆ

11. *Polyxenus pæcilus* Chamberlin, new species

When in full color appearing dark from the presence of a longitudinal brownish band on each side of the clear yellow middorsal region, each band enclosing a yellow spot on each segment, this spot commonly breaking through the lateral edge. Head, viewed from above, with a narrow border of the same brownish color and a narrow stripe of same running from each eye obliquely to middle of anterior margin. Antennæ brownish over yellow. Legs also with brownish markings, especially at ends of joints. Caudal pencils in life white, according to the field note. Proportions of antennal articles as shown in fig. 25. The setæ of the head in general of the form shown in fig. 28. Some of the marginal setæ much smaller, as shown in outline in figs. 26 and 27. The setæ of the anterior lateral fascicles similar in form and structure to those of head, but in the more posterior fascicles they become more slender, with teeth finer. Setæ of the anal pencil of two main types. The first and more abundant form is long and very slender and flexible; distally clavately expanded or narrowly spatulate, with the usual fine teeth over surface and margins (fig. 29). Setæ of the second type, which are peripheral in position, much shorter, not stouter than setæ of last lateral fascicles which they resemble in structure, the terminal lobe commonly bent, somewhat spoon-like. Length 3 mm.

South Santa Inez Island, two specimens taken May 13, 1921; Carmen Island, Puerto Ballandra, a dozen specimens taken May 21; these, which are all badly rubbed, found under stones; Monserrate Island, two specimens taken May 24 "under bark of *Yucca* which grew closest to beach."

The field note with the specimens from Carmen Island states that "the white, waxy, caudal appendage spread fan-wise when disturbed."

Type: Male, No. 1256, and *allotype*, female, No. 1257, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, May 13, 1921, on South Santa Inez Island, Gulf of California.

SIPHONOPHORIDÆ

12. *Siphonophora pseustes* Chamberlin, new species

Dorsum light ferruginous; the venter paler, more yellowish. Rostrum slender, shorter than the head, surpassing the distal end of the fifth article of antennæ. Antennæ moderately clavately widening to fourth article; the fifth and sixth articles of equal and uniform width (fig. 30). Anterior margin of collum nearly straight. Collum about equal in length to the two succeeding tergites combined (Cf. fig. 30). Body com-

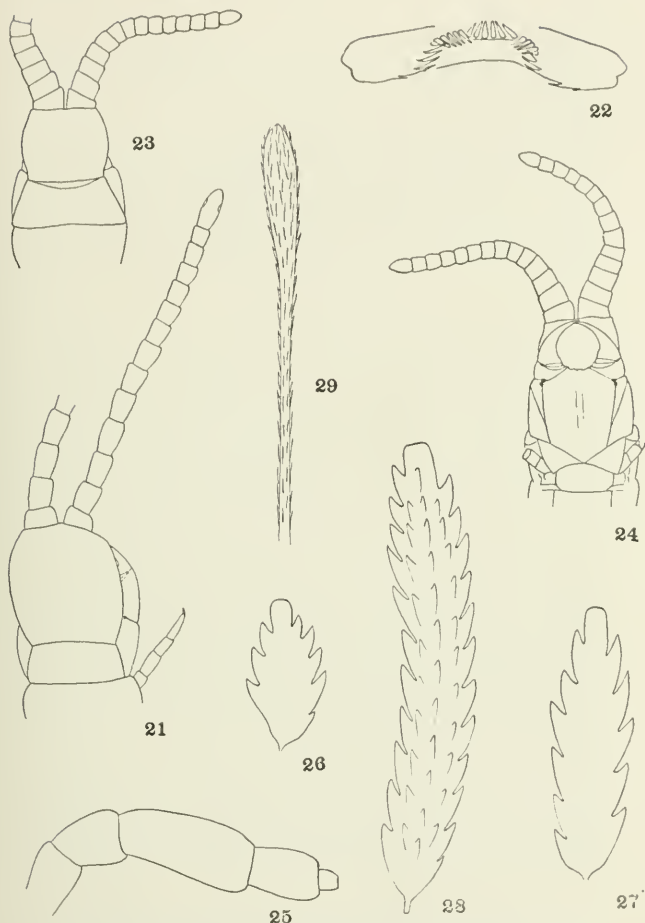


Fig. 21. Anterior end, dorsal view, of *Nesonyx flagellans*, sp. nov., x 46; 22. Labrum of same, x 240; 23. Anterior end, dorsal view, of *Gosothrix insulanus*, sp. nov., x 31; 24. The same, ventral view, x 31; 25. Distal portion of antenna, in outline, of *Polyxenus pacilus*, sp. nov., x 180; 26, 27. Setae from margin of head of same, in outline, x 930; 28. Longer seta from head of same, x 930; 29. Distal portion of a major seta of caudal pencil of same, x 365.

paratively wide, moderately narrowed forward over anterior end and backward over posterior end, depressed. Anterior and posterior pleurites as shown in figs. 31 and 32. Anterior gonopods of male as shown in fig. 33. Number of segments in male type, one hundred and twenty-four. Length, 28 mm.; width, 1.2 mm.

In size and the large number of segments resembling *S. mc.ricanus* Humbert & Saussure, but differing conspicuously in the much more globular head and in the shorter rostrum.

Type: Male, No. 1258, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, July 7, 1921, at San Pedro Bay, Sonora, Mexico.

LYSIOPETALIDÆ

13. *Lysiopetalum tiburonum* Chamberlin, new species

Body narrowing conspicuously at ends, elongate, fusiform; the dorsum depressed. Dorsum and sides fuscous or nearly black, without any distinct longitudinal pale lines or stripes such as are present in *L. lactarius* (Say) or *L. mutans* Chamberlin; the venter paler. Legs pale brown. Antennæ more fuscous, the ultimate article paler. Length of antennæ about equalling greatest width of body. Eyes subtriangular; ocelli in eight longitudinal series, about forty-nine in number, arranged thus: 6, 8, 9, 8, 6, 5, 4, 3. First tergite with anterior half smooth; the caudal half crossed by a series of 10, well-developed, longitudinal keels; just in front of the keels a transverse series of setæ and on each side a single seta between the two most lateral keels. On the next three tergites the setæ stand between the anterior ends of the keels; on subsequent ones they are in the usual posterior position. The repugnatorial pores large, opening through elevated and moderately thickened keels. Between the porigerous keels on each segment are six lower keels that extend to the caudal margin and on each side usually three intermediate ones that are lower and extend only part way to the margin, the outermost of these being the best developed. Below the porigerous keel, on each side, higher and lower keels similarly alternate, these fading out ventrad as usual.

In the male, the processes from coxæ of third legs somewhat clavately widened from base and distally obliquely truncate. Coxæ of succeeding legs back to and including those of the thirteenth segment with white colored, somewhat fungiform, appendages. Gonopods of the male as shown in figs. 34 and 35. Number of segments, sixty-two. Length, about 28 mm.; width, 2 mm.

Type: Male, No. 1259, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, July 5, 1921, at Indian village on south end of Tiburon Island, Gulf of California.

CRYPTODESMIDÆ

XERODESMUS Chamberlin, new genus

Body composed of head and 20 segments. Last tergite reduced, largely covered by the penult. Collum, as in *Cynedesmus*, with 10 marginal lobes. Carinæ laterally trilobed excepting XVI, XVII and XVIII, which are four-lobed. Pore bearing process developed from median lobe; present on segments V, VII, IX, X, XII, XIII, and XV. Dorsum strongly tuberculate, with four longitudinal series of larger tubercles, there being ordinarily three tubercles on each tergite in each of the series.

Genotype, *X. mulegensis* Chamberlin, new species.

Differs from *Cynedesmus* in having the keels laterally trilobed instead of bilobed, in the position of the pore processes, the absence of pores from the sixteenth segment, and in the form of the last tergite. The pore-formula is the same as in *Fsochodesmus*, based on a Floridan species; but this genus presumably has the lobation of the keels and the position of pore-processes as in *Cynedesmus*.

14. *Xerodesmus mulegensis* Chamberlin, new species

Dorsum light brown, the venter yellow. Vertex of head darker than its other regions. Vertigial sulcus of head distinct. Vertex granular. Antennæ distally as shown in fig. 36. Collum not wholly covering head from above; marginal rim rather narrow, not granular, crossed by radial grooves extending to the marginal notches; elevated portion of plate covered with well-marked tubercles (fig. 36). Other tergites densely tubercular, with the four rows of larger tubercles well marked. The pore-bodies in the form of rather large truncate cones replacing the middle lobe as present on the non-poriferous keels; the cones projecting beyond the other lobes, the caudal of which is reduced on the pore-bearing segments. A large lobe at base on caudal margin of keels. Caudal tubercles on posterior tergites projecting caudad from margin. Penult tergite with caudal tubercles of the two median series projecting as two large lobes over the caudal tergite. The latter with caudal margin straight and showing four minute lobes or crenuli and one tubercle on each lateral margin. (Cf. figs. 36, 37, and 38.) Length, 4.5 mm.

Several specimens were taken under stones on the bank of a reservoir and of Santa Rosalia river, no adult male being among them.

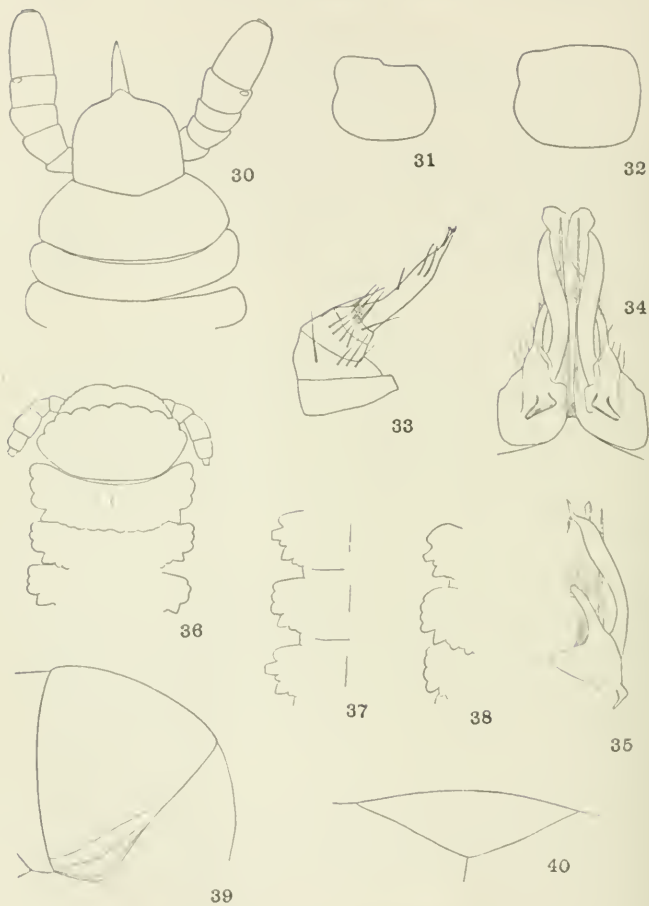


Fig. 30. Anterior end, dorsal view, of *Siphonophora pscustes*, sp. nov., x 46; 31. Pleurite of fifth segment of same, x 46; 32. Pleurite of posterior region of same, x 46; 33. Anterior gonopod of male, lateral view, of same, x 75; 34. Gonopods of male of *Lysiopctalum tiburonum*, sp. nov., x 46; 35. Gonopod of male, lateral view, of same, x 46; 36. Anterior end, dorsal view, in outline of *Xerodesmus mulegensis*, sp. nov., x 45; 37. Fifth, sixth and seventh keels, in outline, of same, x 45; 38. Fifteenth, sixteenth, and seventeenth keels, in outline, of same, x 45; 39. Collum, lateral view, of not fully mature male of *Orthoporus nesiotes*, sp. nov., x 15; 40. Anal scale of same, x 31.

Type: Female, No. 1260, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, May 14, 1921, at Mulegé, Lower California.

SPIROSTREPTIDÆ

15. *Orthoporus nesiotus* Chamberlin, new species

General color brown, darker behind suture of segments and especially adjacent to the narrow, light colored caudal border. Legs light ferruginous, the antennæ darker. Head smooth over vertex and frontal regions; roughened in clypeal region with impressed punctæ and irregular striæ. Eyes about $1\frac{3}{4}$ their diameter apart. On each side the collum is margined below and up the anterior side to margin of head. Above the margining sulcus two oblique sulci. The form of lower end and position of sulci as shown in fig. 39. Pores beginning on sixth segment; at a little more than one-third the distance from suture to caudal edge. Segmental suture smooth, obtusely angled at level of pore. Segments dorsally smooth; striæ beginning a little below pore, the first ones short and weak, the lower ones complete and more sharply impressed. Last tergite much exceeded by the anal valves; caudal angle very obtuse, rounded; with numerous fine punctæ and a few fine coriarius markings, but otherwise smooth. Anal valves mesally compressed and elevated; punctate in manner of tergite. Anal sternite of form shown in fig. 40. Number of segments in the not fully mature male type, 61, of which the six preceding the anal segment are apodous. Length, about 50 mm.; width, 4 mm.; no mature males or females obtained.

In the male the copulatory organs are obvious but are very small, lacking one or more moults of maturity.

Type: Male, No. 1261, *allotype*, female, No. 1262, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, July 5, 1921, on south end of Tiburon Island.

16. *Orthoporus punctilliger* Chamberlin, new species

Color of segments varying considerably in detail. The covered portion of prozonite has typically an olivaceous cast, and the entire prozonite, or most of it, often light olive-testaceous, with posterior portion of segment brownish, a darker band in front of caudal margin, this band broader above and narrowing down the sides. Legs and antennæ dark brown. A dark band across vertex of head. Head mostly smooth, roughened in clypeal region with irregular furrows. Two submedian punctæ at level of antennæ. Eyes 1.4 times their length apart. In the male the collum extends below second tergite, the anterior corner moderately produced downward and forward, rounded. Sulci as shown in fig. 42. Collum of female differing as shown in fig. 43. Sutural impression of segments sharp, essentially smooth above, a little curved opposite pore, which is one-third the distance or less from suture to

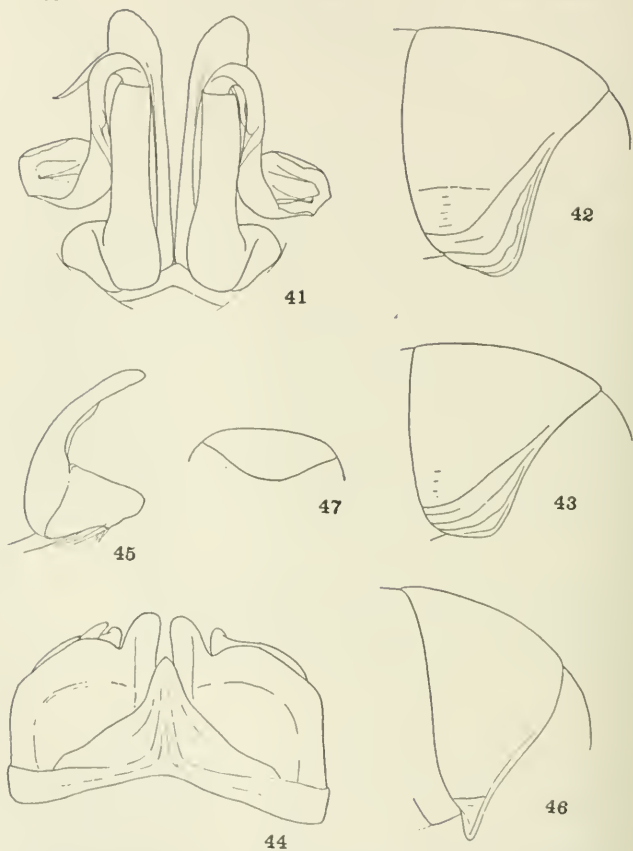


Fig. 41. Gonopods of male, anterior view, of *Orthoporus punctilliger*, sp. nov., x 14.5; 42. Collum of male, lateral view, of same, x 7; 43. Collum of female, lateral view, of same, x 7; 44. Gonopods of male, anterior view, of *Onychelus nigrescens* sp. nov. (the right posterior gonopod removed), x 30; 45. Right posterior gonopod of male of same, x 30; 46. Collum of male of same, lateral view, x 19.5; 47. Anal scale of male of same, x 19.5.

caudal margin. Surface of segments in general densely punctate and with some fine rugæ and impressed lines. Last tergite roughened with fine anastomosing rugæ, the rugæ coarser toward caudal end; punctæ fine. Surface of anal valves similar to that of last tergite. Gonopods of male as shown in fig. 41. Number of segments 67 or 68. Length, to about 120 mm.; width, to 8 mm.

Localities. Sonora: San Pedro Bay, (Ensenada Grande), five specimens July 7; San Carlos Bay, one specimen, July 7.

Distinguished at once from the preceding form in the densely punctate surface of the segments.

Type: Male, No. 1263, *allotype*, female, No. 1264, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, July 7, 1921, at **San Pedro Bay, Sonora, Mexico.**

ATOPETHOLIDÆ

17. *Onychelus nigrescens* Chamberlin, new species

Blackish, not distinctly annulate excepting by the usual narrow pale line along caudal edge. Sulcus of head complete but deeper over vertigial and clypeal region. Setigerous foveolæ in the type 4+5. Eyes very widely separated. Ocelli in seven or eight transverse series: 4, 6, 7, 8, 7, 6, 4, 1. Collum strongly narrowed down each side, the lower end slender, and, in the male at least, extending well below the level of the second tergite, the narrow produced end portion a little twisted so as to appear excavated on the caudal side. Anteriorly margined up to level of eye on each side. A deep longitudinal stria across base of produced lower end (fig. 46). Segments in general constricted, the furrow obvious below and up the sides but weaker across dorsum. Sutural impression absent or obscure. Pore lying at caudal edge of furrow. Last tergite a little exceeded by the valves; strongly rounded caudally; caudal portion set off by a weak sulcus behind which coriarian markings are stronger than in front. Valves meeting mesally in the usually reentrant angle, the borders crossed by a few sulci. Last sternite formed as shown in fig. 47. Gonopods of male as shown in figs. 44 and 45. Number of segments 44. Length, about 27 mm.; width, 3.2 mm.

Unfortunately, all the legs were lost from the specimens.

Type: Male, No. 1265, Mus. Calif. Acad. Sci., collected by Jos. C. Chamberlin, May 18, at **Coronados Island, Gulf of California.**



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JULY 21, 1923

XIX
EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹

THE MELYRIDÆ (Lesser Flower Beetles)

BY

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San Francisco, Calif.

The melyrid fauna of Lower California and adjacent islands is undoubtedly much larger than the present small list of species indicates. The collection considered in this paper is an humble beginning toward the study of the species. It should be the collector's first thought when taking the Melyridæ to note the food plant; to determine in the course of his work whether each species feeds on a single species of plant or on more than one; if the latter, under what conditions. Up to the present time only 18 species are known from the region above mentioned. The following eight new species are described at the present time:

1. *Trichochrous collaris* Blaisdell, new species

Small species. Form oblong, very slightly more than twice as long as wide. Color luteo-testaceous; vertex, occipital region, metasternum and side pieces, abdomen, scutellum and metanotum, a median pronotal vitta scarcely attaining base of apex, terminal joint of the labial and

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

July 21, 1923

maxillary palpi, and tip of mandibles, black; mesosternum more or less black. Pubescence cinereous, moderately dense but not hiding the surface; coarser and subsquamiform on the elytra, finer and linear on head and pronotum; pronotal fimbriae moderate in length and spacing.

Head about as long as wide, distinctly narrower than pronotum at middle, front almost plane between the eyes, finely and sparsely punctate, slightly shining. Antennae moderately stout, slightly compressed; second joint subglobular, third obconical and a little longer than wide, fourth about as long as wide, fifth distinctly wider than the contiguous joints, and with the sixth and seventh prominent anteriorly, eighth less prominent, ninth and tenth transverse and prominent anteriorly, eleventh sub-oval and about a half longer than wide.

Pronotum about a fourth wider than long, strongly convex from side to side, rather strongly declivous at the angles; apex truncate in circular arc; apical angle rounded and finely serrulate; sides rather strongly arcuate, slightly sinuate before the apical angles, slightly oblique and convergent to angles at base; basal angles rounded or represented by a minute denticle; base broadly arcuate; disk finely, sparsely and feebly punctate, surface very slightly subasperate laterally.

Elytra oblong, base feebly sinuate; sides parallel, feebly arcuate in posterior third, apices rather evenly rounded into the sutural margin; disk evenly convex, rather suddenly declivous at sides in basal half; humeri evenly rounded; punctures small, separated by a distance equal to twice their diameter; surface very finely rugulose.

Abdomen rather thickly cinereo-pubescent. Legs relatively rather stout. Described from four specimens.

Length (type) 2 mm.; width 1 mm.

Type: Male, No. 1306, and *allotype*, female, No. 1307, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 10, 1921, at Guaymas, Sonora, Mexico. Two paratypes in author's collection.

In the female allotype the abdomen is more or less pale laterally and apically; the fifth ventral segment is rounded at apex. In the male the fifth and genital segments are pale, the former truncate and feebly longitudinally impressed at middle of apex.

This species is closely related to *T. exiguus* Casey, but is a little more robust, the elytral pubescence a little coarser and denser and the punctures denser and larger. A set of six specimens of *exiguus*, collected near Phoenix, Arizona, is before me.

2. *Trichochrous gratus* Blaisdell, new species

Form small, oblong-oval, moderately convex, about twice as long as wide. Color black, shining, feebly subanecous; legs clear rufous, antennæ slightly darker rufous, last three joints more or less piceous; mouth parts pale. Pubescence abundant, rather short, decumbent, not intermixed with erect hairs, uniform in distribution and argenteo-cinereous in color. Lateral pronotal fringe moderate in length, regular and almost close-set; lateral elytral fringe slightly longer and regular.

Head about as long as wide, slightly wider across the eyes than the pronotal apex; front nearly plane, scarcely convex and just the least irregular; punctures and pubescence sparse, the former scarcely discernible from the minute reticulations of the surface; feebly tumescent just behind the middle of the epistoma, the latter glabrous and impunctate. Antennæ stout, last three or four joints slightly larger, forming a feebly differentiated club which is not compressed; not noticeably serrate; joints not in the least elongate, fifth triangular and slightly prominent anteriorly; in the female joints 2-8 are rather slender, with the club better defined.

Pronotum about a third wider than long, evenly convex, slightly widest behind the middle; apex feebly arcuate in circular arc; base broadly and distinctly arcuate; sides rather strongly arcuate in basal half and thence feebly so to apex; angles rounded, the basal broadly so; disk finely and sparsely punctate, feebly reticulato-punctate in lateral thirds; centrally the surface is microscopically reticulate.

Elytra less than twice as long as wide, oblong, moderately convex from side to side, humeri feebly prominent and rounded; disk finely punctate, punctures separated by a distance equal to about three times their diameter, surface finely rugulose. Body finely punctate beneath. Legs moderate.

Male: Narrower and parallel; antennæ stouter; fifth ventral feebly rounded at apex, slightly flattened on surface. Female: Broader, slightly ovate; antennæ less stout basally; fifth ventral segment arcuately rounded, extreme apex slightly less so.

Length (types) 2.1-2.5 mm.; width .9-1 mm.

Agua Verde, May 26, 1921, E. P. Van Duzee, three examples; Marquer Bay, Carmen Island, May 23, 1921, J. C. Chamberlin, three specimens.

Type: Male, No. 1308, and *allotype*, female, No. 1309, Mus. Calif. Acad. Sci., collected May 26, 1921, by E. P. Van Duzee, at Agua Verde, Lower California. Paratypes in Academy collection and in that of the author.

T. gratus belongs to Casey's group of species, in which the body is clothed with subdecumbent hairs without trace of erect setæ. It evidently falls near *prudens* and *indigenus* in Casey's table. In *prudens* the elytral pubescence is rather coarse; in

gratus it is fine and the upper surface of the body is finely reticulate, the pronotal sides distinctly so. *T. indigenus* Casey occurs as far south as San Diego; my series from there was taken from the blossoms of the Mid-day-bloomer (*Mesembryanthemum aquilaterale* Haworth) growing along the ocean beach at Coronado. It is a larger species than *gratus*; the antennæ are serrate internally throughout, and the pronotal and elytral fringes much shorter. In *gratus* the much shorter antennæ are stouter and not serrate internally. The term anteriorly or internally, when applied to the antennæ, depends on the position, whether it is extended laterally or anteriorly and parallel to the median sagittal plane of the body.

3. *Trichochrous squamiger* Blaisdell, new species

Form oblong, slightly narrowed anteriorly, about twice as long as wide; size small. Color black; legs pale rufous, antennæ similar in color basally and blackish distally; mouth-parts pale, mandibles and palpi black at tip; elytral apical margins more or less rufous. Pubescence coarse, closely recumbent, subsquamiform, dense, nearly hiding the body surface and cinereous in color; hairs rather finer on head and pronotum, also fine and moderately abundant on the body beneath. Pronotal lateral fringe short, regular and rather close-set; elytral fringe slightly longer, quite even. Both fringes pale in color.

Head slightly transverse, muzzle very short. Eyes relatively large and the facets rather strongly convex; sculpturing hidden by the pubescence. Antennæ rather long, extending beyond the pronotal base, moderately compressed, scarcely incrassate; second joint globular, third subcylindrical, fourth, fifth and sixth feebly serrate anteriorly, fifth widest; seventh slightly stout and feebly transversely oval, tenth slightly larger and oblong-triangular, eleventh obovate and about as long as the preceding two taken together.

Pronotum feebly transverse, about a third wider than long, evenly convex from side to side; apex truncate in almost circular arc; sides rather evenly and strongly arcuate as viewed from the side; apical angles obtusely rounded; base broadly arcuate, continuously so with the broadly rounded basal angles; disk finely punctured, sides scabrous, sculpturing more or less hidden by the pubescence.

Elytra oblong, rather less than twice as long as wide; sides parallel, humeri not in the least prominent and rounded; base slightly emarginate, apex moderately broadly rounded; disk rather evenly rounded at the sides, feebly convex on the dorsum; punctures fine, surface very nearly hidden by the squamiform pubescence.

Abdomen very finely and densely punctate. Legs rather slender. Fifth ventral segment feebly sinuate at apex in the male.

Length 1.6 mm.; width .7 mm.

Type: Male, No. 1310, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 22, 1921, at Puerto Ballandra, Carmen Island, Gulf of California.

This small and very neat species should be easily recognized by its bicolored elytra and the coarse subsquamiform pubescence of the elytra. *T. squamiger* is related to *apicalis* Casey and should follow it in the list of species; *apicalis* is much stouter. Described from the unique type.

4. *Trichochrous tortugensis* Blaisdell, new species

Form oblong-ovate, slightly narrowed anteriorly, moderately convex. Color black; femora, antennæ and mouth-parts piceous; tibiæ and tarsi pale rufo-testaceous; elytral borders behind the middle more or less feebly rufous. Pubescence pale throughout, hair-like, recumbent, finer on the head and pronotum, not dense and only partly hiding the body surface. Pronotal fringe moderately stout; that of the elytra a little longer and gradually diminishing in length from humerus to apex. Hairs finer, longer and denser on the abdomen.

Head subquadrate, muzzle short; front quite plane, finely punctate, sculpturing obscured by the pubescence. Eyes moderate in size, convexity and prominence. Antennæ moderate in length, not extending to the pronotal base, slender; fifth joint triangular, subacutely angulate anteriorly, wider than the fourth and sixth, the latter smaller than those that follow, ninth and tenth feebly transverse, eleventh pointed-obovate and about equal in length to the preceding two joints taken together.

Pronotum about a fourth to a third wider than long, evenly convex, quite strongly declivous at the sides; apex truncate; sides rather strongly arcuate, slightly less so and feebly convergent anteriorly; apical angles not broadly rounded; base broadly arcuate; basal angles broadly rounded and continuously so with the sides and base; disk rather finely and moderately densely punctate, rather dull in luster and feebly scabrous, especially at the sides.

Elytra about twice as long as wide, sides diverging slightly posteriorly and widest behind the middle, apex broadly rounded; base very feebly emarginate, humeri not prominent and rounded; disk finely punctate, punctures separated by a distance equal to two to four times their diameter; surface slightly irregular from rugulosity; somewhat depressed on the dorsum and rather strongly rounded into the deflexed sides. Abdomen finely punctate. Legs moderately slender.

Male: Oblong-oval, smaller and more parallel; fifth ventral segment truncate at apex. Female: Oblong-ovate, larger; fifth ventral broadly rounded at apex.

Length (female type) 2.5 mm.; width 1.1 mm.

Four specimens, Tortuga Island, May 11, J. C. Chamberlin; Gonzales Bay, April 29, E. P. Van Duzee.

Type. Female, No. 1311, Mus. Calif. Acad. Sci., collected May 11, 1921, by J. C. Chamberlin, on Tortuga Island, Gulf of California.

T. tortugensis in some way resembles *squamiger*, but the antennæ and femora are more or less piceous and the pubescence hair-like. In *squamiger* the pubescence is dense and squamiform and the legs are rufous throughout. The rufous tinge of the elytral apices in *tortugensis* appears to vary for the males are unicolorous. Both males are more or less rubbed and on that account neither is designated an allotype.

5. *Trichochrous frigidus* Blaisdell, new species

Form oblong-oval, slightly widest posteriorly; moderately strongly convex; about $2\frac{1}{2}$ times longer than wide. Color black, shining; femora more or less nigro-piceous; tibiæ, tarsi and femoral apices ferruginous; mouth-parts and antennæ more or less pale, the latter blackish distally and at base. Pubescence sparse, rather inconspicuous, dual in character and flavo-fuscous in color; erect, scarcely longer than the semi-recumbent hairs and somewhat ashy on the apical declivity; semi-recumbent hairs cinereous in the scutellar region, and on the deflexed sides of the elytra and scattered along the suture; on the head and pronotal disk the hairs are finer and flavescent in color; lateral pronotal and elytral fringes pale and not close-set. On the body beneath the hairs are short, soft and moderately sparse.

Head moderate, about as long as wide, front not impressed, although the surface is slightly irregular; punctures very sparse along the median area, rather more abundant laterally; width across the eyes about equal to that of the pronotal apex. Eyes moderate in size and prominence. Antennæ moderately short and scarcely extending to the basal third of the pronotum; joints five to 11 slightly increasing in width and very slightly compressed; second joint globular, third obconical and less than twice as long as wide, fourth subtriangular, fifth triangular, sixth to tenth asymmetrical and slightly transverse, eleventh obovate, about a half longer than wide and obtuse at apex.

Pronotum slightly transverse and widest just behind the middle, quite strongly and evenly convex from side to side; apex truncate in almost circular arc; apical angles rather broadly rounded; sides rather strongly arcuate in basal two-thirds, less so and slightly convergent anteriorly; base broadly arcuate and continuously so with the sides; disk sparsely and not coarsely punctate, punctures separated by a distance equal to two to four times their diameter, slightly denser near the lateral margin, intervening surface smooth.

Elytra oblong-oval, sides slightly divergent from the base and broadly arcuate in apical two-thirds, continuously so with the broadly rounded apex, apical margin slightly serrulate; humeri not prominent and rounded; base slightly emarginate; disk rather strongly rounded laterally, slightly less convex on the dorsum and very gradually declivous posteriorly; punctures rather coarse, feebly impressed, separated by a distance equal

to two or three times their diameter, surface feebly rugulose. Abdomen finely and rather abundantly punctate; prosternum impunctate. Legs rather slender.

Female: Fifth ventral segment rather broadly rounded at apex.

Length 3 mm.; width 1.2 mm.

Type: Female, No. 1312, Mus. Calif. Acad. Sci., collected April 10, 1921, by E. P. Van Duzee, at Guaymas, Sonora, Mexico.

T. frigidus belongs to Casey's second division; erect setæ plentiful, lateral pronotal fringe regular, apical pronotal angles not prominent, pronotum feebly transverse, sides almost evenly arcuate, legs bicolored. The pubescence is rather unevenly distributed on the elytra and in this last character it differs from *pruinus* Casey. It is quite different from anything heretofore described. Described from the unique type.

6. *Trichochrous lorentensis* Blaisdell, new species

Form oblong-oval, slightly more than twice as long as wide, moderately convex. Color black, surface slightly shining; antennæ and palpi rufous, more or less piceous distally; legs rufo-testaceous, genital segment more or less pale in the male; mandibles pale at base. Pubescence moderately long, abundant, luteo-cinereous, somewhat silvery; consisting of longer, more or less erect and shorter, decumbent hairs; longer hairs on head and pronotum blackish, paler at the sides of the latter and not forming a regular fringe; on the elytra less erect, not very evident on the disk and posteriorly, but more distinct at the sides and forming a rather long and irregular fringe.

Head moderate in size, front not impressed, sparsely and finely punctate, epistomal region impunctate, labrum pale. Eyes moderate in size and prominence. Antennæ moderate in stoutness, compressed and extending to the basal fourth of the pronotum, bristling with pale setæ and increasing very gradually and slightly in width toward apex, feebly serrate anteriorly; second joint subglobular, third obconical, fourth subtriangular, fifth triangular and slightly larger and a little wider than the contiguous joints, 6-10 subequal in size, subtriangular, eleventh about twice as long as wide and narrowed toward apex.

Pronotum about a fourth wider than long, rather strongly and evenly convex from side to side, more strongly so anteriorly, widest just behind the middle; apex truncate in circular arc; apical angles obtusely rounded; sides rather strongly arcuate in basal two-thirds, less so and convergent anteriorly; basal angles broadly rounded into the sides and base, the latter broadly and evenly arcuate; disk finely punctate, punctures separated by a distance equal to two or three times their diameter.

Elytra oblong, less than twice as long as wide, moderately strongly convex, slightly flattened on dorsum, apex somewhat parabolically rounded; disk punctate as on pronotum, surface slightly scabrous. Ab-

domen very finely punctate; black except apical margin of fifth segment. Legs moderate in stoutness.

Male: Narrower; fifth ventral segment broadly truncate; genital segment somewhat feebly impressed along median line. Female: Broader, slightly more robust, less parallel; antennæ shorter and less robust; fifth ventral broadly rounded at apex.

Length (types) 3.1-3.3 mm.; width 1.2-1.5 mm.

Loreto, May 19, 1921, 21 specimens taken on Sebastiana. Concepcion Bay, June 17, one male.

Type: Male, No. 1313, and *allotype*, female, No. 1314, Mus. Calif. Acad. Sci., collected May 19, 1921, by E. P. Van Duzee, at Loreto, Lower California. Paratypes in collection of the Academy and in that of the author.

T. loricensis, according to Casey's table, falls near *hirtellus* Casey which it resembles in having sides of pronotum converging anteriorly, but it differs from that species in the uniform coloration of the elytra and in many details. A series of the latter species is before me which was collected at Indio and Coachella, California. Casey mentions two males from Arizona.

7. *Trichochrous francisquitus* Blaisdell, new species

Form oblong-oval, slightly narrowed anteriorly, about $2\frac{1}{4}$ times longer than wide, moderately convex. Color black; legs rufous; antennæ fuscous, more or less rufous at base. Pubescence not dense, not hiding the body surface, cinereo-plumbeous in color. Hairs nearly recumbent and rather less than moderate in length, with numerous longer, erect stiff and black setæ on the head, pronotum and elytra, those on the latter intermixed with pale erect hairs, all rather longer and more bristling at the sides; those of the pronotal side margins pale and intermixed with darker ones and not forming a regular fringe; elytral fringe pale, quite regular, rather long, very gradually diminishing in length toward apex and not very closely placed. On the under surface of the body the hairs are nearly recumbent, pale, finer and not very long; shorter on the legs.

Head moderate in size, slightly transverse; front nearly plane, feebly and longitudinally bi-impressed, punctures moderately close, rather small and distinct. Antennæ short and stout, moderately compressed, very gradually increased in width distally, joints 5-10 transverse, eleventh triangulo-obovate, about a fourth longer than wide. Eyes moderately large and convex.

Pronotum about a half wider than long, a little narrower than the elytral base; base and apex broadly and rather feebly arcuate; sides evenly and somewhat strongly arcuate and continuously so with the broadly rounded angles; base about a fourth wider than the apex; disk

evenly and moderately convex from side to side, very sparsely punctate, punctures small and rather more abundant laterally.

Elytra oblong, sides parallel, less than twice as long as wide, very moderately convex on the dorsum, more strongly rounded laterally, rather abruptly deflexed at sides in basal half and slightly inflexed; humeri rounded and slightly prominent; punctures fine, separated by a distance equal to two or three times their diameter; surface somewhat transversely wrinkled and microscopically subreticulate. Abdomen finely and rather densely punctate.

Length 4 mm.; width 1.8 mm.

Type: Female, No. 1315, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 10, 1921, at San Francisquito Bay, Lower California.

T. francisquitus is to be placed with those species in which the hairs of the lateral margins of the pronotum do not form a regular fringe, pubescence uniform in distribution and mainly pale in color, body unicolorous, general color black, legs red and therefore, according to Casey's table, related to *crinifer* and *loretensis*, but differing from the latter in the larger size, sparser pubescence and short, stout antennæ. Described from the unique type.

8. *Dasytastes sparsus* Blaisdell, new species

Form oblong-ovate, rather depressed on the elytral disk. Color black; legs piceo-ferruginous, antennæ and palpi of the same color. Surface feebly shining. Pubescence pale, very short and sparse, inconspicuous and of the same length throughout; pronotal and elytral fringes absent.

Head slightly transverse, muzzle short; front flat and finely granulate. Eyes moderate. Antennæ rather slender, eleventh joint slightly widest, tenth feebly transverse, joints sixth to the ninth subequal and about as long as wide, fourth and fifth subtriangular, the latter slightly wider than the contiguous joints.

Pronotum widest at basal third, about as long as wide, strongly convex; apex feebly arcuate, rounding into the sides, the latter feebly serrulate and moderately arcuate posteriorly, less so and convergent anteriorly; base broadly arcuate; basal angles represented by a denticle; disk rather finely but not densely punctate, punctures separated by a distance equal to two or three times their diameter.

Elytra oblong-oval, very feebly convex on the disk; base truncate, humeri rather prominent, but not broadly rounded; sides slightly divergent posteriorly; apex broadly rounded, the margin feebly serrulate; punctures about the same size as those of the pronotum, surface rather transversely rugulose, extreme base smooth between the punctures and slightly impressed within the humeri. Scutellum slightly transverse and oblong. Finely and sparsely punctate beneath. Legs very slender. Fifth ventral segment rounded at apex.

Length 2 mm.; width .8 mm.

Type: Female, No. 1316, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 27, 1921, at Angeles Bay, Lower California.

In *sparsus* the pronotal sides are rather strongly deflexed and when viewed from the side appear quite strongly and evenly rounded from apex to base. *D. sparsus* differs from all of the described American species. It should precede *remissus* Casey in our lists with the following synoptic characters: Head small, pronotum deflexed at the sides and not explanate; legs ferruginous throughout and very slender. Described from the unique type.

The following synoptic statement of characters will aid in identifying the species of Trichochoirus known to occur on the mainland of Lower California, on the islands to the west in the Pacific Ocean and those to the east in the Gulf of California; and in the adjacent Sonoran region of Mexico:

SYNOPTIC TABLE

Body clothed with recumbent pubescence without intermixed erect setæ; lateral pronotal fringe distinct and regular.....	1
Body clothed with recumbent pubescence, with erect setæ on the upper surface; pronotal fringe even and distinct.....	6
Body clothed with recumbent pubescence, with erect setæ on the the upper surface; without a regular or close-set fringe at sides of the pronotum.....	7
1. Legs unicolorous	2
Legs bicolorous	5
2. Body black	3
Body more or less pale throughout; elytral pubescence coarse and subsquamiform; small species.....	<i>collaris</i> , n.sp.
3. Elytra bicolorous	4
Elytra not bicolorous, usually feebly subæneous; pubescence not dense and hair-like; pronotal sides evenly and strongly arcuate with the angles; disk reticulato-punctate laterally; legs pale	<i>gratus</i> , n.sp.
4. Elytra more or less broadly pale flavo-testaceous at the lateral and apical margins; legs pale.....	<i>convergens</i> Lec.
Elytra faintly rufous at apical margin; pubescence dense and cinereous; elytral hairs coarse and lanceolately squamiform; very small species; antennæ short, legs pale....	<i>squamiger</i> , n. sp.
5. Form slender and subcylindrical; elytra black; basal angles of pronotum very distinct.....	<i>fulvotarsis</i> Bland.

- Form oblong-ovate; elytral apices sometimes slightly rufous; pronotal sides rather strongly arcuate; basal angles very broadly rounded *tortugensis*, n.sp.
6. Legs and antennæ rufous; pubescence dense; pronotal disk strongly asperato-punctate *brevicornis* Lec. 9
7. Pubescence of the elytra uniform in distribution..... 8
 Pubescence of elytra uneven in distribution..... 8
8. Pubescence pale with blackish hairs in a broad pronotal vitta and in a broad, well defined stripe on each elytron not attaining the apex; erect setæ pale; legs rufous..... *varius* Casey.
 Pubescence for the most part flavo-fuscous, sparse and rather inconspicuous; erect hairs scarcely longer than the semirecumbent hairs; hairs cinereous in the scutellar region, on the deflexed sides of the elytra and along the suture; femora blackish; tibiæ, tarsi and femoral apices ferruginous; surface shining, with a very feeble metallic tinge..... *frigidus*, n.sp.
9. Legs black 10
 Legs pale 11
10. Form oblong-oval; pubescence dense, long and coarse; erect setæ mostly black and bristling..... *sordidus* Lec.
 Form subcylindrical, rather narrow and convex; pubescence sparse, especially on the pronotum, moderately long, intermixed with moderately numerous long erect and black setæ; pronotal disk not rugose at the sides..... *squalidus* Lec.
11. Elytra of uniform color throughout..... 12
 Elytra paler at apical margin..... 15
12. Elytra black throughout 13
 Elytra pale rufous throughout; head and thorax black; legs pale *rufipennis* Lec.
13. Larger species; erect setæ longer and black; legs pale..... 14
 Smaller species; erect setæ pale..... *loretensis*, n.sp.
14. Form elongate, rather narrow, convex; pronotum parallel; body highly polished; legs bright rufo-ferruginous.... *lucidus* Casey
 Form oblong-oval; pronotum moderately strongly, evenly arcuate at the sides, angles broadly rounded; long blackish setæ intermixed with paler ones on the elytra; legs pale.....
 *francisquitus*, n.sp.
15. Elytral recumbent pubescence dense; legs, antennæ and labrum pale; coriaceous hind margins of the abdominal segments and tip of fifth pale..... *hirtellus* Lec.

Thrichochrous antennatus Motsch. is given by Dr. Horn as occurring on the peninsula of Lower California. It is common in the vicinity of San Francisco, California, but in the vicinity of San Diego it is replaced by *indigenus* Casey and does not occur in Lower California. The species so referred by Dr. Horn may very possibly be one of those described above as *gratus* or *tortugensis*.

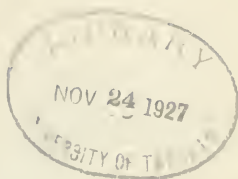
LIST OF SPECIES

With notes on distribution

1. *Asydates explanatus* Casey. 2 specimens.
Puerto Refugio, May first.
2. *Trichochrous collaris*, n. sp. 4 specimens.
Guaymas, Mexico, April 10.
3. *Trichochrous gratus*, n. sp. 8 specimens.
Agua Verde, Lower California, May 26; Marquer
Bay, Carmen Island, May 23.
4. *Trichochrous convergens* Lec.
Utah; Arizona; Margarita Island.
5. *Trichochrous fulvotarsis* Bland.
Oregon? (Horn); Ft. Yuma, California; Calmali
Mines.
6. *Trichochrous squamiger*, n. sp. 1 specimen.
Puerto Ballandra, Carmen Island, May 22.
7. *Trichochrous tortugensis*, n. sp. 4 specimens.
Tortuga Island, May 11; Gonzales Bay, April 29.
8. *Trichochrous brevicornis* Lec.
Southern California; Calamajuet.
9. *Trichochrous frigidus*, n. sp. 1 specimen.
Guaymas, Mexico, April 10.
10. *Trichochrous sordidus* Lec.
Southern California; San Esteban and Magdalena
Islands.
11. *Trichochrous squalidus* Lec. (Syn. *tejonicus* Lec.)
Fort Tejon, California, southward to San Julio.
12. *Trichochrous rufipennis* Lec. 1 specimen.
Gila, Arizona; San Francisquito Bay, May 10.
13. *Trichochrous lorentensis*, n. sp. 1 specimen.
Loreto, Lower California, May 19.
14. *Trichochrous lucidus* Casey.
Lower California; Guadalupe Island.

15. *Trichochrous varius* Casey. 5 specimens.
Benson, Arizona; Guaymas, Mexico; Mulegé, Lower California.
16. *Trichochrous francisquitus*, n. sp. 1 specimen.
San Francisquito Bay, May 10.
17. *Trichochrous hirtellus* Lec.
Arizona; Cape San Lucas, Lower California.
18. *Dasytastes sparsus*, n. sp. 1 specimen.
Angeles Bay, June 27.

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JULY 21, 1923

XX

EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹

NOCTUIDÆ (MOTHS)

A new subspecies of *Escaria clauda* Grote

BY

WM. BARNES AND F. H. BENJAMIN

Escaria clauda pallens Barnes & Benjamin, new subspecies

Ground color, cream-white, the primaries with maculation more or less obsolescent brown to blackish. In the better marked specimens the course of the maculation is entirely similar to typical *E. clauda*. Secondaries with a faint pale brownish edging at base of the fringe; else practically colorous with the primaries but possessing a more silky luster.

Expanse: 17-18 mm.

Type: Male, No. 1301, Mus. Calif. Acad. Sci., taken by E. P. Van Duzee, June 27, 1921, at Angeles Bay, Lower California.

Paratypes: 3 females, May 4, June 26, and June 27, 1921; in Mus. Calif. Acad. Sci. *Allotype*, female, June 27: 1

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

July 21, 1923

male, June 27, and 1 female, May 7, in collection of William Barnes, all collected at Angeles Bay, by E. P. Van Duzee. One *paratype*, Olancho, Inyo Co., California, in collection of William Barnes.

This insect is apparently a southwestern race of *Escaría clauda* Grote, from which it can be told by its paler colors and more obsolescent maculation. It is the antonym of *E. homogena* McD., the type of which has been examined by the authors, and a photograph of which is before them.



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XXI

EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹

ANTHOMYIDÆ AND LONCHÆIDÆ
(Kelp Flies and their allies)

BY

J. R. MALLOCH

Bureau of Biological Survey, Washington, D. C.

In the material submitted for identification there are several new and interesting species. The new species are fully described herein and notes presented on the others.

Family ANTHOMYIDÆ

1. *Melanochelia immaculiventris* Malloch, new species

Male and female: Black, densely pale gray pruinose; head in male with pale gray pruinoscence on interfrontalia and yellow on orbits, face and cheeks; in female with whitish pruinoscence on all parts; thorax with three very faint linear brownish vittæ; abdomen entirely pale gray pruinose, or with a pale, almost indistinguishable central linear vitta and a yellowish tinge on each side of each tergite; legs black, gray pruinose, tibiae tawny; wings whitish; calyptæ white; halteres yellowish.

Eyes bare, separated by more than one-third of the head width; orbits narrow, with an inner series of bristles all of which except the upper one are incurved, and an outer series of setulose hairs; parafacial about as wide as third antennal segment and as wide as half the height of cheek; third antennal segment about twice as long as second, not extending to mouth; arista swollen on its basal half, with very short pubescence. Abdomen in male narrowly ovate, subdepressed, fifth sternite with

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

August 21, 1923

a broad shallow notch; hypopygium small; in female more broadly ovate, apical tergite with a medium transverse series of strong bristles, the apical margin unarmed. Fore tibia without a median bristle; mid femur with a posteroventral series of closely placed short bristles which are stronger in the male; mid tibia with two posterior bristles; hind femur with a sparse series of bristles on basal half of posteroventral surface and a similar but complete series on anteroventral; hind tibia with one anteroventral, two anterodorsal and one posterodorsal bristle, the last near base. Costal thorn minute.

Type: Male, No. 1317, Mus. Calif. Acad. Sci., taken June 10, 1921, by E. P. Van Duzee, on **San José Island, Gulf of California**, and *allotype*, female, No. 1318, Mus. Calif. Acad. Sci., taken April 25, 1921, at Tepoca Bay, Sonora, Mexico. *Paratype*, one male, taken May 30, 1921, on San Francisco Island, Gulf of Mexico.

This species is an aberrant one and might be placed in *Phyllogaster* but for the structure of the fifth sternite in the male.

Two other species belonging to this group are in the collection but as both are represented by one female each I cannot definitely identify them.

2. *Phyllogaster longispina* Malloch, new species

Male and female: Black, slightly shining, densely gray pruinose; head black, densely white pruinose; thorax not vittate; abdomen with faint brownish marks consisting of a dorsocentral interrupted vitta except on basal segment, and two pairs of round spots, one on second and the other on third tergite; legs black, knees narrowly reddish; wings hyaline; calyptæ white, halteres yellow.

Frons a little over one-third of the head width, with four or five bristles on each orbit, the upper one curved laterad as in last species, and with numerous setulose hairs between the bristles and eyes; parafacial a little wider at base of antennæ than width of third antennal segment, narrowed below; cheek distinctly higher than widest part of parafacial; antennæ extending two-thirds of distance to mouth, third segment narrow, fully twice as long as second; arista as long as antennæ, densely short haired, the longest hairs about twice as long as its basal diameter. Thorax with three pairs of dorsocentrals behind suture; presutural acrostichals weak; sternopleurals 1:2. Abdomen of male cylindrical, tapered posteriorly, segments subequal, one or two long bristles on sides of each tergite, and a transverse series at middle of fourth tergite; hypopygium small; fifth sternite largely concealed, the processes not very broad nor conspicuously bristled. Abdomen of female broader than in male; armed similarly, but the apical transverse series of bristles on fourth tergite is very weak and there are four curved spines on genital segment, one strong pair with a weaker pair vertically between them. Fore tibia unarmed at middle; mid femur with three or four long bristles on basal half of posteroventral

surface; mid tibia with two posterior bristles; hind femur with an irregular series of anteroventral bristles and three or four long widely spaced bristles on basal half of posteroventral surface; hind tibia with one antero-ventral, two anterodorsal, and two posterodorsal bristles, and some long anterodorsal setulæ, the bristles at middle of tibia and also the pre-apical anterodorsal and posterodorsal bristles very long. First posterior cell not narrowed apically.

Length, 5-6 mm.

Type: Male, No. 1319, *allotype*, female, No. 1320, Mus. Calif. Acad. Sci., and seven *paratypes*, taken April 29, 1921, by E. P. Van Duzee, at **Gonzales Bay, Lower California**.

3. *Fucellia maritima pacifica* Malloch, new subspecies

Aldrich had no records of this species from the Pacific but I have seen many examples from this coast, amongst them being a large series in the present collection. I can detect no differences between these and specimens from the Atlantic coast except that they are on the average larger, paler in color, and have the apices of femora and apex of fourth tergite in both sexes rufous. For this variety I propose the above name.

Length, 5.5-6 mm.

Type: Male, No. 1321, and *allotype*, female, No. 1322, Mus. Calif. Acad. Sci., taken by E. P. Van Duzee, April 19 and 20, 1921, on **San Esteban Island, Gulf of California**. *Paratypes*, 7 specimens, same data as type; 8 specimens Las Animas Bay, Gulf of California, May 8, 1921; 8 specimens, Tepoca Bay, Sonora, Mexico, April 25, 1921 (E. P. Van Duzee).

4. *Fucellia rejecta* Aldrich

Male: Differs from the female, from which sex the species was described, in having the femora usually more or less grayish in middle, and the wings faintly clouded apically.

The fifth sternite has the processes stout, rounded at apices and with sparse long bristles outwardly; the hypopygial forceps are slender, slightly curved, and a little longer than the processes of fifth sternite. Mid tibia usually with one anterodorsal and three posterodorsal bristles; hind femur with irregular bristles on anteroventral surface except basally, and some finer bristles on posteroventral surface which are longest at base and absent from beyond middle to near apex; hind

tibia with three anteroventral, four anterodorsal, and three posterodorsal bristles. Veins not thinner basally, the costal setulæ short on the entire length from humeral vein to apex of second.

Length, 6.5-7 mm.

Originally described from one female taken near San Diego, Cal. This species is represented in the collection from Tepoca Bay, Sonora, Mexico, April 25, and Las Animas Bay, Gulf of California, May 8, 1912.

About two years ago I received from W. F. Thomson three specimens of this species that were reared from larvæ found feeding on the eggs of the Grunion (*Leuresthes tenuis*), a small marine fish that deposits its eggs in a unique manner in the sand above the normal high water mark on the seashore in California. This material is referred to by Mr. Thomson in his paper on the spawning of the Grunion.*

Family LONCHÆIDÆ

5. *Lonchæa armata* Malloch, new species

Male: Black, glossy, thorax bluish, abdomen brassy; frons blue-black; lunule, face, and orbits silvery tomentose; antennæ and palpi black; legs black, basal two segments of tarsi rufous, apical three segments fuscous; wings clear, veins yellowish; calyptræ yellowish white, fringes white, some of the hairs at bend fuscous; knobs of halteres black.

Eyes bare; frons fully twice as long as wide at vertex, slightly narrowed anteriorly, granulose centrally, with numerous setulose hairs; upper orbits microscopically strigose, with a few hairs behind the anterior bristle; lunule sparsely haired on sides; antennæ rather widely separated at bases, extending but little over midway to mouth, second segment with one long setulose hair which is about as long as third antennal segment, the latter narrow, not twice as long as wide; arista subnude; cheek about as high as width of third antennal segment, with three or four stout bristles above lower margin. Thoracic hairs setulose; pteropleura with two or three long setulose hairs in middle; some fine hairs surrounding base of stigmatal bristle; scutellum bare except for the four bristles. Abdomen ovate, very little tapered posteriorly, the tergites subequal in length, surface hairs not numerous nor long. Wing venation as in *polita* Say. Fringes of calyptræ longer at the bend than elsewhere.

Length, 4.35 mm.

Type: Male, No. 1323, Mus. Calif. Acad. Sci., taken by E. P. Van Duzee, June 14, 1921, at Escondido Bay, Lower California.

*State of Cal. Fish and Game Comm. Fish Bull. 3, 1919, p. 9.



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XXII

EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹

THE BEMBICINI (Digger Wasps)

BY

CHARLES L. FOX

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The present paper is a report on the bembicine wasps belonging to the group fossore, or digger wasps, taken by Mr. E. P. Van Duzee while with the 1921 Expedition of the California Academy of Sciences to the Islands of the Gulf of California. Sixteen species and one variety are enumerated of which seven are described as new. I am greatly indebted to Dr. Barton W. Evermann and Mr. E. P. Van Duzee for the privilege of examining this interesting material.

1. *Steniolia dissimilis* C. L. Fox, new species

In Parker's and Fox's keys this species runs to *duplicata* from which it can be distinguished by the shape of the clypeus, flagellum, lower part of frons, ultimate tergite and very different genital stipites of male. Length 16-18 mm.

Male: Flagellum slender in form, segments 3-11 below slightly concave, bearing small inconspicuous glabrous areas; testaceous above, paler below, except the two basal segments which are yellow below. Clypeus shorter, its length half its width, more strongly carinate on median line at base

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

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and apex more deeply excavated than in *duplicata*. Space between insertion of antennæ sharply carinate (obtusely so in *duplicata*). Ultimate tergite broad and arcuated. Second sternite bearing a prominent process, eighth ending in three curved spines, the central one with a short spine arising from its base beneath. Legs having reddish tinge. Wings hyaline, veins brown. Head, thorax, basal joints of legs and median segment covered with white pubescence, longer on vertex and frons, on the abdomen very short and inconspicuous. Male genital stipites much wider and more arcuated medially on outer margin than in *duplicata* (Parker fig. 20, 21), bearing on the upper surface medially a long broad depression.

Color black with the following yellow maculations; large lateral spots on scutellum more or less curved on inner margin (quadrate in *duplicata*); fascia on second tergite continuous, emarginate anteriorly in the middle, the emargination produced to right and left, its posterior border notched; fasciæ on remaining tergites of similar pattern with emarginations reduced on each succeeding segment; second sternite except very small anterior lateral spots and broad medium longitudinal stripe reaching base of process; continuous fasciæ on third sternite curved and narrowed medially on anterior border and sternites 4-6 entirely. Color and pattern of maculations similar to *duplicata* except as given above.

Female: Quite similar to male in general appearance and color marking, differing as follows: Clypeus, mandibles except apex, labrum, scape below, lower part of frons and anterior orbits all almost white, faintly tinged with yellow; posterior orbits extended well on to vertex and metapleuræ almost entirely yellow; fasciæ on sixth tergite with deep anterior notch; median black line lacking on first sternite, large median pear-shaped black spot on second sternite, broad yellow continuous fasciæ on sternites 3-6 with shallow median anterior emargination (when the abdomen is strongly flexed sternites appear entirely yellow), sixth also with a median narrow longitudinal black spot, more or less broken. Legs and flagellar segments stouter. Combs on anterior tarsi well developed. Described from one male and three females.

Type: Male, No. 1324, Mus. Calif. Acad. Sci., collected April 10, 1921, and *allotype*, female No. 1325, collected April 7, 1921, at Guaymas, Sonora. *Paratypes* from Guaymas, April 6, and Agua Verde, Lower California, May 26, in Academy's collection and in that of the author.

2. *Steniolia meridionalis* C. L. Fox, new species

Allied to *duplicata* and intermediate between that species and *dissimilis* separable from both by its smaller size and bright greenish yellow color, shape of male genital stipites and shape of flagellar segments. Length 12-16 mm.

Male: Flagellum shorter and stouter than in *dissimilis* segments 4-11 carinate on posterior border, carinæ not inclosing pits as in *duplicata*; testaceous above, paler below, except the two basal segments which are

yellow below as in *dissimilis*. Pubescence, wings, legs, process on second sternite and spines on eighth sternite as in *duplicata* and *dissimilis*. Male genital stipites proportionately shorter than in *duplicata*, otherwise similar.

Color of maculations bright greenish yellow, pattern of markings much the same as in *dissimilis*, differing as follows: Small yellow transverse line on posterior border of scutum lacking; large lateral yellow spots on scutellum more or less quadrate as in *duplicata*; metapleuræ almost entirely yellow; black longitudinal median line on first sternite missing; fasciæ on sternites 3-6 curved and somewhat medially narrowed anteriorly;

Female: Similar to the male in general appearance except for the following differences: Clypeus, labrum, scape below, first two flagellar segments more or less, lower part of frons, lower part of anterior orbits, all white (in the male yellow); small transverse line (wanting in two specimens) on posterior border of scutum yellow. Tarsal combs strongly developed. Described from two males and five females. This may later prove to be a subspecies of *duplicata*.

Type: Male, No. 1326, Mus. Calif. Acad. Sci., collected April 10, 1921, and *allotype*, female No. 1327, collected April 8, 1921, at Guaymas, Sonora. *Paratypes* from Guaymas, April 14; Tiburon Island, April 23; Angeles Bay, May 7; La Paz, June 5, in Academy's collection and in that of the author.

3. *Stictiella formosa* Cresson

Guaymas, Sonora, April 7, one example.

4. *Stictiella villosa* Fox

Guaymas, Sonora, April 7, 10, three examples.

5. *Stictiella bifurcata* C. L. Fox, new species

Labrum long and arcuate; process on second sternite broadly bifurcate at apex. Length 15-18 mm.

Male: Labrum long and arcuate. Flagellar segments 2-12 carinate beneath. Head, thorax, basal joints of legs including femora, and base of abdomen clothed with long white pubescence. Legs with no special modifications, pulvilli large and distinct. Ultimate tergite broad and truncate. Second sternite bearing a very prominent process, broadly bifurcate at apex; tips curved posteriorly to right and left. Eighth sternite ending in three curved spines, the central one with a short spine arising from its base beneath. Wings hyaline, very long, reaching end of abdomen, more than twice as long as thorax and median segment together. Genital stipites broad, arcuated on the outer margin at half its length, obliquely directed outwards at apex.

Color black; with the following yellow maculations: Labrum; mandibles except apex; scape below; space between insertion of antennæ; triangular spot on either side of anterior ocellus, almost united below; anterior and posterior orbits (in two paratypes extending brokenly across vertex); narrow posterior dorsal border and sides of prothorax, including tubercles, interrupted by a narrow irregular line extending from the tubercles; tegulæ anteriorly; on scutum, a pair of anterior elongated discal spots, a pair of small round spots close to posterior border (wanting in one paratype), and a line above tegulæ; large lateral spots on scutellum; fascia on metanotum; broad curved fascia on dorsum of median segment extended down medially on posterior surface (wanting in one paratype), sides of same; metapleuræ almost entirely; large irregular spot covering more than half of mesopleuræ extending downwards, joining its fellow on the mesosternum and extending backwards to the middle coxæ; broad fasciæ on tergites (except first) continuous, fascia on the first broken into pair of large lateral spots and pair of posterior dorsal spots, that on the second with deep anterior emarginations produced to right and left posteriorly, fasciæ on remaining tergites 3-6 of somewhat similar pattern with emarginations reduced on each succeeding segment; fasciæ notched on posterior border, more or less; apex of ultimate tergite; sternites entirely except very small black anterior lateral spots on the first and second, and small median black stripe on the second (wanting in three paratypes); coxæ except basally; trochanters except small spots above and below; femora except stripe above (wanting on intermediate and posterior femora in two paratypes); tibiæ except small spot above at proximal end of posterior pair (wanting in two paratypes) and tarsi. Flagellum black above, testaceous below. Described from six males.

Type: Male, No. 1328, Mus. Calif. Acad. Sci., collected May 1, 1921, at Puerto Refugio, Angel de la Guardia Island, Lower California. *Paratypes* from Puerto Refugio, May 1; Angeles Bay, May 5, June 26, in Academy's collection and in that of the author.

6. *Stictiella bifurcata albicera* C. L. Fox, new variety

Separable from *bifurcata* by the brighter color of the maculations, soiled white of the fasciæ on the dorsum of tergites and their different pattern. Length 15-18 mm.

Male: Characters of head, thorax, abdomen including appendages and genital stipites as in *bifurcata*. Pattern of maculations similar to *bifurcata* with following exceptions: fascia on dorsum of median segment reduced to lateral spots (lacking in two paratypes); fasciæ on tergites more or less interrupted medially and anterior emarginations produced to right and left on tergites 2 and 3, more strongly curved posteriorly.

Color of maculations bright greenish-yellow, becoming soiled white on the dorsum of the tergites. Described from four males.

Type: Male, No. 1329, Mus. Calif. Acad. Sci., from **Guaymas, Sonora**, April 10, 1921. *Paratypes* from Guaymas, April 7, 15, in the Academy's collection and in that of the author.

7. *Stictiella directa* C. L. Fox, new species

Closely allied to *bifurcata*, smaller and more slender; second sternite with a less prominent process, bifurcation at tips less conspicuous; central apical spine on eighth sternite straighter and longer. Length 13 mm.

Male: Process on second sternite less prominent, bifurcation at apex smaller than in *bifurcata*; central apical spine on eighth sternite straighter, longer and sharper than in *bifurcata*. Other characters of the head, thorax, abdomen and appendages, pubescence, and genital stipites as in *bifurcata*.

Color and pattern of maculations as in *bifurcata* except that the yellow fascia on the dorsum of the median segment is reduced to minute broken lines or spots; legs entirely yellow, except black stripe above on anterior femora, and black spots more or less on coxæ and trochanter as in two paratypes of *bifurcata*.

Female: Similar to the male in color and general appearance. White pubescence on the labrum, clypeus, and anterior orbits shorter and denser than in the male giving a silvery appearance. As is often the case with females of other species maculations are more highly developed than in male. Fascia on the median segment broad and distinct. The eight females examined show variation in the pattern of the fasciæ on the tergites, in some specimens the anterior emarginations on the first tergite being produced so far posteriorly as to nearly or quite enclose large spots, and on tergites three and four the anterior emarginations may be reduced to small black spots. Described from two males and eight females.

Type: Male, No. 1330, and *allotype*, female No. 1331, Mus. Calif. Acad. Sci., collected June 27, 1921, at **Angeles Bay, Lower California**. *Paratypes* from Angeles Bay, June 26, 27; Espiritu Santo Island, June 1; Agua Verde, May 26; Pond Island Bay, June 30, and Carmen Island, May 22, in the Academy's collection and in that of the author.

8. *Stictiella megacera* Parker

Tepoca Bay, Sonora, April 25, one example.

9. *Stictiella scitula* Fox

Guaymas, Sonora, April 7, 10, 11, thirteen female examples; Tiburon Island, April 22; Tepoca Bay, April 25, two female examples.

Parker in his Revision of the Bembicene wasps of America north of Mexico (Proc. U. S. Nat. Mus. vol. 52, p. 47) raises the question as to whether this species may not be the female of *villosa* on account of the unusual development of the pubescence, the similarity of the wing venation of the two, and their common habitat. The fact that the three specimens of *villosa* taken by Mr. Van Duzee at Guaymas are all males and the thirteen specimens of *scitula* taken at the same locality are all females seems to point to this conclusion.

10. *Stictiella exigua* Fox

Pond Island Bay, June 30, July 1; Guaymas, April 11; Tiburon Island, July 3; Espiritu Santo Island, May 31; Angeles Bay, June 26, 27, nine examples; Todos Santos, four females collected by J. R. Slevin August 12, 1919. In two males from Tiburon Island and Espiritu Santo Island the yellow discal spots on the scutum are wanting; the long lateral lines on the scutum above the tegulae are reduced to spots; the curved fascia on the dorsum of the median segment is reduced to small narrow anterior lateral lines and the maculations on the side of the thorax are reduced.

11. *Stictiella argentata* C. L. Fox, new species

Allied to *pulla*; differing in color and pattern of maculation; character and color of pubescence; shape of labrum, mandibles, scutum, ultimate tergite, process on second sternite, and very different genital stipites. Length 9-12 mm.

Male: Mandibles almost devoid of teeth on inner border, only one present and that vestigial; labrum longer, apex broader and more roundedly truncate than in *pulla*; flagellum cylindrical, slender, dark above, greenish-yellow and testaceous below; broad longitudinal median depression on scutum, more conspicuous than in *pulla*; ultimate tergite broader, apex rounder than in *pulla*; second sternite bearing a pair of prominent approximated processes larger and more curved posteriorly than in *pulla*, eighth sternite ending in three curved spines, the central one with a short spine arising from its base beneath; wings hyaline, veins brown; pubescence white and short, longer and denser on frons; the labrum, clypeus and anterior orbits having a conspicuous silvery appearance and the thorax in a lesser degree, the abdomen showing a trace; genital stipites truncate at apex, outer angles produced subacutely.

Color black with the following soiled white or yellow maculations: labrum; mandibles except apex; clypeus; scape below; space between insertion of antennæ; triangular spot on either side of anterior ocellus; broad anterior orbits shortened above; posterior orbits broad below, very narrow above almost reaching the vertex; narrow posterior dorsal border and sides of prothorax except narrow line in front of tubercles; tegulæ; broad lateral lines above tegulæ extending anteriorly and posteriorly almost the whole length of the scutum; large lateral spots on scutellum approximated medially (in two specimens united); metanotum entirely; curved fascia on dorsum of median segment extended down medially on posterior surface (small lateral spots on one specimen); lateral angles and sides of median segment except black spot immediately posterior to spiracles; metapleuræ almost entirely; large spot covering half of the mesopleuræ, and continuous with the yellow on the mesosternum; broad continuous fasciæ on tergites 1-6, first curved and somewhat narrowed medially on anterior border, remainder with shallow anterior emargination on either side of mid-dorsal line; apical half of ultimate tergite; first sternite except small longitudinal anterior lateral spots; second sternite except median anterior spot; remaining sternites except narrow basal border varying somewhat in width (when the abdomen is strongly flexed sternites appear entirely yellow); coxæ almost entirely (in some specimens minute basal lines above and below); trochanters; femora; tibiæ and tarsi. Fasciæ on tergites, scutellum and metanotum soiled white, elsewhere pale yellow.

Female: Similar to male except that the scape and first sternite are entirely yellow. Described from seven males and ten females.

Type: Male, No. 1332, and *allotype*, female, No. 1333, Mus. Calif. Acad. Sci., collected June 26, 1921, at Angeles Bay, Lower California. *Paratypes* from Angeles Bay, May 27, June 26, 27, in Academy's collection and in that of the author.

12. *Bicyrtes variegata* Olivier

Guadalupe Point, Concepcion Bay, June 18; La Paz, June 3, two examples.

13. *Bicyrtes tristis* C. L. Fox, new species

Aspect of *quadrifasciata*. Labrum narrower; wings clearer; ultimate tergite more arcuate and narrower at apex; genital stipites very different, yellow fasciæ on tergites narrower and not attenuated medially. Length 15 mm.

Male: Labrum narrowed towards apex; clypeus arched on apical margin; flagellum stout, bearing smooth flattened areas beneath on segments 4-12; wings very slightly diffusely infumated, clearer than in *quadrifasciata*; ultimate tergite arcuated and narrowed at apex, outer margins plain (in *quadrifasciata* triangularly produced on either side with

basal notch); eighth sternite ending in three curved spines; legs with no special structures, pulvilli distinct. Genital stipites wide and broadly arcuate on outer margin, shaped much as in *capnoptera* as shown by Parker (figs. 128, 129).

Color black; with the following yellow maculations: scape below; clypeus, except narrow basal border; lateral borders and apex of labrum; basal half of mandibles; anterior orbits, abbreviated above; very narrow posterior orbits; narrow irregular posterior margin of pronotum; greater part of tubercles; tegulae more or less; short narrow line on scutum at base of anterior wing; small lateral round spots on scutellum; lateral angles of median segment; narrow fasciae on tergites 1-6 interrupted medially (not attenuated medially and 4 and 5 not shortened as in *quadrifasciata*); lateral spots on sternites 2-6; very small spots distally above and below on coxae and trochanters; distal ends of femora below, more extensive on anterior pair; tibiae except broad stripe below and tarsi except apical segments which are more or less dusky. Described from one male.

Type: Male, No. 1334, Mus. Calif. Acad. Sci., collected June 3, 1921, at La Paz, Lower California.

14. *Bembix sayi* Cresson

Guaymas, Sonora, April 8; La Paz, June 3, 4, three examples.

15. *Bembix occidentalis* Fox

Las Animas Bay, May 8; Mulegé, May 14; La Paz, June 3, 4, four examples; La Paz, June 28, 1919, collected by J. R. Slevin, three examples.

16. *Microbembex monodonta* Say

Las Animas Bay, May 8; Guaymas, April 14, 15; Mulegé, May 14; Puerto Refugio, Angel de la Guardia Island, June 29; Loreto, May 20; Pond Island Bay, Angel de la Guardia Island, July 1; Tepoca Bay, April 25; Monserrate Island, June 13; twenty-four examples.

17. *Microbembex aurata* Parker

Loreto, May 20; Mulegé, May 14; Guaymas, April 10; La Paz, June 3, 4, 5, twenty examples; La Paz, June 28, 1919, one example collected by J. R. Slevin.



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XXIII

EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹

OBSERVATIONS ON SURFACE DISTRIBUTION OF
MARINE DIATOMS OF LOWER
CALIFORNIA IN 1921

BY

W. E. ALLEN

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Nearly all the plankton collections were taken while the boat was in motion and the same methods were used as those which I have described for steamer trips between San Diego and Seattle in 1920 (Allen 1921). Methods of handling the material were also similar. In case of each catch, three gallons of water was dipped from the surface of the sea with a pail and then poured through a filtration net of number 25 bolting silk such as has been used in the past three years for all of our measured water collecting. Hence, when the size of a catch has been estimated in numbers per liter it can properly be compared as to size with any other catch in any of our measured water series.

Most of the plankton samples taken by Dr. Baker were obtained in the Gulf of California, but on the trip to the Gulf, 17 samples were taken in the Pacific Ocean. On account of the necessarily random nature of the sampling it is impossible

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

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to arrange the material in any sequence of particular significance and I am therefore following the very simple plan of separating the discussion into four sections on the basis of time and of direction of travel.

On account of the very small numbers of dinoflagellates in most catches I am giving them merely incidental mention.

I. Southbound in the Pacific Ocean

Out of the 17 catches made in ocean waters, April 7 to 10, only two showed numbers of cells near to or exceeding 25,000 per liter. The larger of these two catches was made about 25 miles southwest of Abrejos Point and the other about 70 miles northwest of Cape San Lazaro (see map). Four samples between Magdalena Bay and the Gulf of California yielded nothing. Most of the other catches were very small.

The number of species of diatoms recorded was 29, only three of which were sufficiently prominent to deserve special mention. These were *Chatoccras scolopendra* Cl., *Eucampia zoodiacus* Ehr., and *Nitzschia seriata* Cl. Other forms were grouped for tabulation under the names *Chatoccras* sp., *Rhizosolenia* sp., and *Thalassiothrix* sp. The most prominent single species was *Eucampia zoodiacus* Ehr., a form which has not shown much prominence in the La Jolla region so far.

Dinoflagellates were noticed in only seven of the 17 samples and then in very small numbers, mostly fewer than 100 per liter.

II. Northbound in the Gulf of California

On the trip up the Gulf 10 samples were taken in the four days from April 10 to April 13 and 11 were taken in the six days from April 21 to 26. Five of the 10 catches in or near the southern end of the Gulf were blank. Of the 21 samples obtained in the northward run four yielded more than 100,000 diatom cells per liter, a number which indicates a fair degree of productivity. One of these four catches was made near the southern end of Espíritu Santo Island, another about 30 miles east of San Nicolas Bay, a third near Isla Raza and

the fourth about 10 miles southwest from Georges Bay (see map).

Forty-four kinds of diatoms were listed from the catches made on this trip and four species were prominent at one or more of the localities sampled. These were *Bacteriastrum elongatum* Cl., *Chaetoceras debile* Cl. (including *Ch. curvisetum* Cl.), *Leptocylindrus danicus* Cl. and *Nitzschia seriata* Cl. *Bacteriastrum elongatum* Cl. has not been noticed in the La Jolla region and its prominence in the Gulf seems to be distinctive. I was also impressed by the appearance of unusual numbers of *Thalassiothrix acuta* Karsten at one place. At various places there were fairly large numbers of unsegregated small species of *Chaetoceras*. Some species of *Rhizosolenia* were present in nearly all catches.

Dinoflagellates were almost entirely absent from all catches in this group.

III. Southbound in the Gulf

The southward trip covered about six weeks, from April 28 to June 8, samples being taken as the expedition shifted its investigations from one island to another. The 52 catches were fairly well distributed through this time.

Eight catches of diatoms were in excess of 100,000 cells per liter and two of these were near 500,000 per liter. Two of the eight were taken near San Luis Island and four near Angel de la Guardia Island at various points. The other two were obtained near Carmen Island.

Forty-six kinds of diatoms were listed as being present at one or more localities. Eighteen species were included in the final tabulation and most of the others were grouped under *Chaetoceras* sp., *Coscinodiscus* sp. and *Rhizosolenia* sp. Of the 18 species segregated there were six, *Chaetoceras compressum* Laud., *Chaetoceras criophilum* Castr., *Chaetoceras debile* Cl. (including *Ch. curvisetum* Cl.), *Chaetoceras scolopendra* Cl., *Nitzschia seriata* Cl. and *Thalassiothrix nitzschioides* Grun., which attained numerical prominence at one or more places. In addition to these there were three species which attracted especial attention because they have not been observed in the San Diego region. They were *Bacteriastrum elongatum* Cl.,

Chatoceras neapolitanum Schr., and *Guinardia flaccida* Castr. The large cells of *Guinardia* made it conspicuous even though its numbers were not notably large.

On this trip a few catches were made in which dinoflagellates appeared in some thousands per liter. *Ceratium furca* (Ehr.) Clap. u. Lach. and *Gonyaulax polyedra* St. were the principal species.

IV. Second Trip Northward in Gulf

This was the last trip made by the expedition and it lasted about four weeks, from June 8 to July 11. Forty-one samples were taken at fairly regular intervals over that time. Of these seven showed diatoms in excess of 100,000 per liter, one near San José Island, two near Carmen Island, two near Angel de la Guardia Island and two near Tiburon Island.

Forty-four kinds of diatoms were recorded, 15 of which were placed in the final tables. Most of the others were included under the designations *Chatoceras* sp. or *Rhizosolenia* sp., or omitted on account of small numbers. Of the 15 species segregated for tabulation there were only three which were found in greater numbers than 30,000 per liter at any time. These were *Chatoceras curvisetum* Cl. (including *Ch. debile* Cl.), *Chatoceras didymum* Ehr. and *Thalassiothrix mitzschoides* Grun. Small forms included under the catchall designation *Chatoceras* sp. furnished far the largest numbers on this northward trip, reaching more than 300,000 per liter in three different catches.

Dinoflagellates were very few or absent from most catches.

General Discussion

Except for its positive evidence as to what could be, and was, found at a given time and place, a series of catches obtained by such discontinuous random sampling can have little more than suggestive value in an attack upon the problems of the ecologic complex. The main points of positive evidence have been stated in the foregoing sections, hence this part of the discussion is chiefly concerned with suggestive features based on this evidence.

In the first place it may be noted that this evidence agrees with that obtained from surface catches between San Diego and Seattle (Allen 1921) in its showing of apparent weakness of influence of latitude in limiting the range of species. So far as we yet know such common species as *Chatoceras debile* Cl. and *Nitzschia seriata* Cl. are just as likely to be amongst the most abundant surface forms at 24° north latitude as they are at 48° north latitude, or at any intermediate point on the Pacific Coast.

In the second place, it seems that we get no very definite indication of the influence of topography although we might expect that conditions in the Gulf would be enough different from oceanic conditions to make at least an appreciable showing. From the information at hand we can get little but the fact that three or four forms not so far observed in our oceanic work are present in the Gulf. This fact is largely offset by the presence of several species in prominence similar to that which we sometimes or often find in the open sea. Large catches being mostly found near islands may possibly be due to the expedition keeping close to islands, but it does have some significance as regards the possible influence of land.

In view of the general recognition of the influence of temperature upon life processes and the activities and characteristics of organisms it is rather surprising to see so little evidence of its effects in this series. Although most of the larger catches were taken in temperatures near 20° C or a little lower, a few were taken in temperatures near 29° C and some of the prominent species in the latter catches were such as have been commonly obtained in our La Jolla region (as well as at some points in the Gulf) in temperatures ranging from 16° C to 20° C. Whatever else we may think about it we may be sure that at present, temperature alone is not a trustworthy index as to either quality or quantity of diatom production in surface waters in various areas.

Concerning the influence of upwelling water there is no satisfactory evidence in this series.

In conclusion we may summarize as follows:

1. There is a striking general similarity in the surface catches of diatoms in Lower California waters to those of much more northerly waters.

2. A few species appearing in more or less prominence in the Gulf of California have not been observed in oceanic waters of the California region.

3. There are marked differences in productivity of various areas in the Gulf, some of which are probably permanent and some of which may be temporary or conditional.

4. There is indication that general production of pelagic dinoflagellates is low in the Gulf region.

5. It seems quite probable that general conditions of plankton production in the Gulf are essentially similar to those in the sea.

6. The Gulf of California offers plenty of opportunity for both extensive and intensive studies of micro-plankton.

7. This series offers another excellent illustration of the fact that the measured water method can be used for valuable studies of micro-plankton under circumstances prohibitive of other methods.

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XXIV

EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹

THE BIRDS

BY

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Extremely few mammals were obtained on this expedition, and as no notes of value concerning mammals were kept by Mr. Virgil W. Owen, who represented the departments of Ornithology and Mammalogy, nor by any other member of the party, there is not sufficient material at hand upon which to base a mammalogical report. The following ornithological report is compiled partly from the data accompanying the eggs and very limited number of birds collected by Mr. Owen, but principally from a series of excerpts concerning the birds, which Mr. Joseph R. Slevin, in charge of the expedition, very kindly segregated from his field notes in order to furnish assistance in making out as full a report for these two departments as might be possible under such adverse circumstances.

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

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As Mr. Slevin was not familiar with all the species of birds met with, no specific names are given here unless identity is certain.

The expedition started from Guaymas, Mexico, in the gasoline power boat *Silver Gate*, Captain John Ross, Master, with orders to proceed northwesterly along the coast of Sonora, touching at each island of any size, until Georges Island (about N. Lat. 31°), near the northern end of the Gulf of California, was reached; then to cross the gulf and proceed in a southerly direction along the eastern shore of the peninsula of Lower California to about N. Lat. 24°; then to return northward as far as the time limit might allow, revisiting some of the more important islands on the way; and then to return to Guaymas.

The first island reached was San Pedro Nolasco, a short distance northwest of Guaymas, on April 17. Here the California Brown Pelican (*Pelecanus californicus*) was found to be quite numerous, with many nests containing young almost ready to fly. The Brewster Booby (*Sula brewsteri*) also was nesting here, with incubation far advanced as shown by the eggs taken by the party. Ravens were quite plentiful, but small land birds were scarce. Among the latter the Ash-throated Flycatcher (*Myiarchus cinerascens cinerascens*), Western Chipping Sparrow (*Spizella passerina arizonæ*), and the Desert Sparrow (*Amphispiza bilineata deserticola*) were collected, while some other finches and an unidentified hummingbird were noticed.

San Pedro Martir Island was reached on April 18, but no nesting colonies were found. In fact, the island seemed to have been deserted by sea birds. A few Ravens, some finches and one hummingbird were all the land birds noticed. Among the finches, was the San Lucas House Finch (*Carpodacus mexicanus ruberrimus*), of which a set of eggs was secured, with incubation just commenced.

San Esteban Island was visited April 18, where several Frazar Oyster-catchers (*Haematopus frazari*) were seen and two sets of nearly fresh eggs were taken. Some Western Gulls (*Larus occidentalis*) were nesting upon the rocky beach just above high-water mark. Land birds were fairly common on this island, which was of considerable size; among them some

hummingbirds and flycatchers were noted and the Desert Sparrow was identified. Western Ravens were quite common, and two pairs of Ospreys (*Pandion haliaëtus carolinensis*) were nesting on top of a large rock at the end of a beach. One of these nests contained a young bird.

Isla Raza was reached April 21. Although this island is on the western side of the Gulf of California, it was so little out of the way that the crossing was made from San Esteban Island in order to find out if Heermann Gulls (*Larus heermanni*) were nesting there, and to collect some sets of their eggs. Great numbers of these gulls were found there, but the impression was created among the party that it was too early for the nesting season, as most of the many nests found scattered about the island were empty. A few were found that contained one egg each, and one with two eggs. It was discovered later that the island was periodically visited by eggers from the mainland who gathered the eggs to sell for food; this accounted for the conditions met with. The nests were scattered about the valleys on the island, usually where there was some shelter from the wind in the way of low-growing shrubs, and were merely depressions in the earth with no lining whatever.

Three nests of the Elegant Tern (*Sterna elegans*) were found on this island, and a few Royal Terns (*Sterna maxima*) were seen, as were also some Western Gulls and California Brown Pelicans. No land birds were noted by any of the party.

Isla Partida was visited April 22. Opposite the anchorage a petrel colony was discovered, situated in a rock slide just at the back of the rocky beach. In the apertures in this slide were countless numbers of bats.

It was found that two species of petrels formed this colony, the Least Petrel (*Halocyptena microsoma*) and the Black Petrel (*Oceanodroma mclania*). On April 22 only the Black Petrel was laying, the eggs showing all stages of incubation, but the Least Petrels, although occupying their burrows among the rocks, had not yet commenced to lay.

This island was visited on two other occasions, May 3 and June 24. On May 3 the Least Petrel was laying and a number of sets were secured, all perfectly fresh. It was still laying on

June 25, when a few more sets in all stages of incubation from fresh to advanced were dug out of the rock slide. On this last visit some of the young of the Black Petrel were found just losing the last of the down from the breast.

On Isla Partida land birds were very scarce, a finch being the only one mentioned as having been seen. Royal Terns, Western Gulls, California Brown Pelicans, cormorants, and Frazar Oyster-catchers were noted, while two empty nests of the last species were found.

Patos Island was landed upon April 23, and a Tule Wren (*Telmatodytes palustris paludicola*), in badly worn and faded plumage, was taken, but no record of any other bird appears.

Tepoca Bay, on the coast of the Mexican mainland, was visited April 25, in search of water, and an Osprey's nest on top of a cliff at the beach was examined. This is described as an immense affair, probably three feet high, composed of clean driftwood and sticks, and lined with seaweed. It appeared to be perfectly fresh, but empty, and no birds were seen near it.

Georges Island, the northern limit of the expedition's itinerary, was reached April 26. Here was found a large colony of terns, consisting mostly of the Elegant Tern with a few Royal Terns scattered through it. The number of birds in the colony was estimated at between three and four thousand, most of which were nesting, while the eggs were in all stages of incubation. Of the nesting of the Elegant Tern, Owen says: "The nests were merely slight depressions in the somewhat rocky soil on a flat portion of the island and so close together that one could not walk among them without occasionally crushing an egg. Royal Terns' nests containing eggs were scattered throughout this colony, but most numerous about the outer edge. There were probably about 1000 pairs of Elegant Tern nesting here. No difficulty was experienced in distinguishing between the eggs of the two species of terns, as the size and coloration differ very decidedly.

Some authorities upon the subject state that the Elegant Tern lays from one to three eggs, but most of them discreetly say nothing about the size of the clutch of this species of tern. In his account of the finding of the Elegant Tern breeding on Ceralvo Island, Gulf of California, April 9 to 15, 1910, Mr. Wilmot W. Brown is quoted as saying that "One egg is gen-

erally what they lay, sometimes two, but only rarely." Mr. Slevin states that especial pains were taken by Mr. Owen and himself to ascertain if nests with more than one egg could be found, but they finally agreed that there was absolutely no evidence of this tern laying more than a single egg in the colonies they examined. As above stated, the eggs were often so close together that it was difficult for an observer to avoid crushing some of them under foot when walking among the nests, and sometimes two eggs were found so near each other as to have the appearance of composing a set. The birds, however, kept backing away as the intruders advanced and were so crowded together, as shown by photographs taken by the party, that eggs were more or less rolled around and misplaced as the birds retreated. In addition to this there was an almost constant gale blowing, some of the gusts of which were strong enough to roll eggs around to some extent, so that there was good reason for the finding of two or three eggs together at times in the more crowded areas of the colony. But, in all such instances, the eggs differed so markedly in coloration and pattern that it seemed absurd to assume that they might have been laid by the same bird. The more isolated nests, on the outer edges of the colony, were especially examined, but no unquestioned set of two eggs was found.

In the large series of eggs of the Elegant Tern brought back by the Academy expedition, there are no two quite alike. In fact, with the exception of the absence of the greenish and (cobalt) bluish ground colors that are so often found among the eggs of the murres (*Uria*, species), there is practically as much variation among the eggs of the Elegant Tern as among those of the murres. These tern eggs vary in ground-color from pure white through slightly pinkish cream color to a decided maroon, with a more or less distinct pinkish tinge in all except the pure white. Many of the eggs have what seems to be a sort of secondary ground marking of grayish lavender, or sometimes purplish gray, frequently rather faint, generally in the shape of small spots or blotches, though sometimes in fair sized patches. In form the dark markings are anything from streaks, specks, spots, blotches, or wreaths, up to large patches; and from pinkish chocolate to very nearly black in

color, with infinite variation in size, number, shape, and arrangement of these markings.

Not much was recorded by the party in regard to the habits of the Elegant Tern, but it was generally agreed that they did not appreciably differ from those of the Royal Tern.

Although landings were made on Ceralvo Island at three different places, one of which was supposed to be the sandbar where Mr. W. W. Brown found this species breeding in 1910, as referred to above, the Academy party did not come across the Elegant Tern on this island. Three nests were found by Mr. Owen on Isla Raza when the first visit was made to that island April 21. A nest containing one fresh egg was found there on the second visit, May 4. Mr. Owen's data of this set describe the nest as "merely a depression in the earth, in a level, barren area between two ridges. It was several hundred yards back from and probably 100 feet above the water."

In his *Life Histories of North American Gulls and Terns* (Bulletin 113, U. S. Nat. Mus., p. 220), Mr. A. C. Bent gives the measurements of 27 eggs of this species as follows: "average, 53.5 x 38 millimeters; the eggs showing the four extremes, measure **57** x 39, 55 x **40.5**, and **51** x **35.5** millimeters."

Of the Academy's collection three groups of 25, 10 and 10, respectively, taken at random, were measured, the average of the 45 eggs being 54.6 x 36.8 millimeters, while it so happened that the difference in the averages of the three groups was only 1 mm. for each dimension. The extreme measurements are of eggs which were, of course, selected from the whole series. These are: (C. A. S. No. 3501) **60.6** x 39.2; (C. A. S. No. 3494) 52.8 x **40.4**; (C. A. S. No. 3424) **47.8** x 37.2; (C. A. S. No. 3523) 54.2 x **32.6**. In this series there are seven eggs of greater longitudinal diameter, with several others very close to it, and four that measure less than Bent's minimum longitudinal diameter, with several others very close to it, and four that equal or are less than his minimum latitudinal diameter. There is also one "runt" egg, well colored and marked, which is about the size of a pigeon's egg.

In the 111 sets taken of the Royal Tern, all of but one egg each, the smallest egg measured 62 x 44.5 millimeters, showing no overlapping with the eggs of the Elegant Tern in the

respective measurements. The eggs of this species do not exhibit nearly so much variation as do those of the Elegant Tern, and very frequently more than one egg is laid to a set.

The Heermann Gull (*Larus heermanni*) was found nesting on Georges Island, in a small colony. Most of the nests contained eggs about ready to hatch, while many contained young.

In Mr. A. C. Bent's (*op. cit.*) excerpt from the letter of Mr. Pingree I. Osborn describing a breeding colony of the Heermann Gull, the description of the ground-color and markings of the eggs does not coincide very closely with these characters in the series obtained by the Academy expedition.

While there are a number of eggs in our series of which the ground-color is of a sort of pearl gray, there is a very manifest tinge therein which is much more of a brownish cast than would be indicated by the expression "a very slight creamy tinge," as described in the above excerpt. A good many of the eggs are "ashy gray" and "light bluish gray," as Mr. Osborn says, but also a good many have a ground-color that matches very closely the Light Buff, Plate XV, of Ridgway's *Nomenclature of Colors*. Others, again, are very close to the pale Olive Buff, Plate XL, of that work.

The fainter spots and blotches are lavender-gray of varying degrees, but the heaviest markings match the Vandyke Brown, Plate XXVIII, of the above work, but often of a much darker shade than that of the plate.

Of one set of three eggs two are of a bluish white, with very small, faint markings of a pale brown color, looking much like slight stains, while the third egg has the ground color a little more creamy than the other two, but is very evenly and closely covered with fine specks of brown, like a finely speckled egg of the domestic turkey. Quite a number of eggs, on the other hand, are heavily marked with very dark Vandyke Brown at the large end, sometimes in the form of a rough wreath.

As native eggers were systematically robbing the birds of their eggs on the island where most of the Academy's series of Heermann Gulls was obtained, it is not fair to use the average measurements of this series in comparison with those given by Mr. Bent, unless it is kept in mind that they were obtained from eggs of a much disturbed colony. As a matter of fact,

the Academy series averages a good deal less for both dimensions, although most of the *extremes* are greater, the longest egg being 67.5 x 41.8 mm. (set No. 3220, C. A. S. Coll.), the shortest 55.1 x 40.5 mm. (set No. 3198, C. A. S. Coll.), the broadest 62.1 x 45.1 (set No. 3174, C. A. S. Coll.), and the narrowest 58.9 x 35.7 mm. (set No. 3215, C. A. S. Coll.). Mr. Bent gives, for 52 eggs measured, extremes of 64 and 53 millimeters for the longitudinal, with 45.9 and 37.5 millimeters for the latitudinal measurements.

The nests of Heermann Gulls found on this expedition were mere depressions in the earth, with no lining whatever, as has been noted by other observers.

Western Gulls were nesting on Georges Island, most of the nests containing young.

A limited number of the Red-billed Tropic-bird (*Phaëthon atherus*) and Brewster Booby (*Sula brewsteri*) also were breeding on this island, with incubation far advanced, and a small colony of cormorants (species?), with many young in nests, was seen here. This proves to be the most northerly breeding ground of the Red-billed Tropic-bird, it being about 100 miles north of the island of San Pedro Martir, which has heretofore been considered as the most northerly one. Other than these mentioned above, the only birds noted by the party were six red-winged blackbirds (species ?) and a Long-tailed Chat (*Icteria virens longicauda*).

San Luis Island was visited April 28. A colony of something like 2000 California Brown Pelicans, with young almost ready to fly, was found and Western Gulls were commonly nesting here, with many nests containing young. Half a dozen Reddish Egrets (*Dichromanassa rufescens*) were seen in a small lagoon, and a few empty nests of the Osprey were noted. Very few land birds were seen.

A landing was made on the island of Mejia April 30, but the only birds recorded were "many ravens and one flycatcher," with one Frazar Oyster-catcher that was secured.

The island of Angel de la Guarda was reached May 1. Mr. Slevin's notes concerning the bird life here are as follows: "Noted few land birds, mostly flycatchers and verdins. Saw an Osprey nest from our anchorage, with parent bird on nest all day long, shielding young from the hot sun. Saw one of the

birds bring a large fish to the nest." A nest with three slightly incubated eggs of the Desert Sparrow (*Amphispiza bilineata deserticola*) was taken on this island, and a male Green-tailed Towhee (*Orcospiza chlorura*) was secured. At Lagoon a colony of Reddish Egrets was found nesting on the ground in the midst of thick brush.

On May 2 a landing was made on Granite Island, where was found a small colony of California Brown Pelicans, all with young, and one of Reddish Egrets with young in most of the nests. The Reddish Egrets were nesting in the salicornia.

Isla Partida was again visited on May 3, as set forth under the first mention of this island. Nothing except petrels was recorded in the way of bird life here.

Isla Raza was visited the second time May 4, to look for eggs of the Heermann Gull. On this occasion the reason for the absence of eggs on the first visit was discovered. Mr. Slevin says, in his notes: "Found eggers on the island collecting eggs as fast as they were laid. The Mexicans cover the island twice a day and very few nests escape them. Consequently [we] found few full sets. Early in afternoon another vessel arrived and sent party ashore after eggs. This date must have been the height of the nesting season and there were several thousand birds about the island." Very few Western Gulls were seen on this visit. A small colony of Royal Terns was found near the landing place, but the birds showed no signs of nesting.

Las Animas Bay, on the peninsula, was visited May 8, but the only bird mentioned as being found there is the White-winged Dove (*Melopelia asiatica*). Of this species one set of eggs, with incubation just begun, was taken.

The next mention of bird life is on Sal si Puedes, which was visited May 9. A colony of California Brown Pelicans, all with young birds, and a few Heermann Gulls nesting, with eggs about ready to hatch, were the only species recorded in the notes.

On May 10 a landing was made at San Francisquito Bay, Lower California, of which Mr. Slevin's notes say: "Quite a few land birds here, hummingbirds, thrashers, cactus wrens, verdins, quail, and flycatchers." The cactus wren must be the San Lucas species (*Helcodytes brunnicapillus affinis*), but the

verdin mentioned is just on the border line between *Auriparus flaviceps flaviceps* and *Auriparus flaviceps lamprocephalus*. A nest of each of these species was taken; the eggs of the cactus wren were only slightly incubated, but those of the verdin were in an advanced state of incubation.

On San Marcos Island, May 11, only a few land birds were noted, "mostly [San Lucas] House Finches and flycatchers."

On Santa Inez Island, May 13, a couple of young Frazar Oyster-catchers, a few days old, were secured, but no mention is made of any other birds.

Point Sta. Antonita was reached May 16, and a landing made on the peninsula, where land birds were noted as plentiful; Cape Verdin, [San Lucas] Cactus Wren, jays, quail, and gnatcatchers being mentioned in the notes.

The island of Ildefonso was touched at on May 17. Here, at the end of March and in the beginning of April, 1909, Mr. Wilmot W. Brown found "an immense number" of Heermann Gulls nesting at the southeastern end of the island, but the Academy party records only the Blue-footed Booby (*Sula nebouxi*) as nesting there.

Coronado Island was visited May 18, and land birds are reported from there as "fairly common;" flycatchers, Desert Sparrow, hummingbirds, San Lucas House Finch, one duck hawk (*Falco peregrinus anatum*, probably), several Ravens and (Turkey) buzzards being those enumerated.

Carmen Island was reached May 21, and from there are recorded the San Lucas House Finch, White-winged Dove, and San Lucas Cardinal (*Cardinalis cardinalis igneus*).

On Danzante Island a few land birds were noted May 24, verdins and flycatchers being the only ones mentioned, while a Plumbeous Gnatcatcher (*Polioptila plumbea*) was found nesting, with incubation commenced in the three eggs secured, at Puerto Escondido, Lower California. No other birds mentioned at the latter place.

On May 25 a landing was made on Monserrate Island. Some Cape Verdins, flycatchers, and gnatcatchers were noted, but neither of the last two was identified as to species.

Agua Verde Bay, on the peninsula, was visited May 26, and Mr. Slevin's notes contain the following: "Found White-winged Doves abundant. Collected one set of fresh eggs about

six feet up in mesquite tree. Found one other set with young nearly ready to leave nest. [Valley] Quail abundant but rather shy."

On San Josef Island, which was very brushy, San Lucas Cardinals, White-winged Doves, Desert Sparrows, humming-birds and woodpeckers were found to be fairly numerous on May 28.

On May 29, upon San Francisco Island, a few small land birds were seen, and ravens, vultures and Frigate Birds were found to be common.

The south end of Ceralvo Island was reached June 6. Many California Brown Pelicans were on the beach, and land birds, especially hummingbirds, were found to be numerous. The Great Blue Heron (*Ardea herodias sanctiluca*) was nesting there, with eggs in an advanced state of incubation. Sets of eggs of the Cape Verdin and the Desert Sparrow were secured and found to be fresh.

Little mention is made by any member of the party of the bird life seen on the return voyage to Guaymas. The facts are recorded that hundreds of ravens and vultures were seen around the water hole at Angeles Bay, on the Lower California peninsula, June 26; a Wilson Plover (*Ochthodromus wilsonius*), female, was taken on Angel de la Guarda Island, June 30; and that at Pelican Island, on July 5, there were several old Osprey nests in cacti, while countless numbers of Frigate Birds were seen on the sandbar off the east end of the island. No further notes upon birds appear in the records of the expedition after this last date.

LIST OF SPECIES NOTED

1. Western Gull (*Larus occidentalis*): San Esteban Island, April 18; Isla Raza, April 21, May 4; Isla Partida, April 22; Georges Island, April 26; San Luis Island, April 28.
2. Heermann Gull (*Larus heermanni*): Isla Raza, April 21, May 4; Georges Island, April 26; Sal si Puedes, May 9.
3. Royal Tern (*Sterna maxima*): Isla Raza, April 21, May 4; Isla Partida, April 22; Georges Island, April 26.

4. Elegant Tern (*Sterna elegans*): Isla Raza, April 21, May 4; Georges Island, April 26.
5. Least Petrel (*Halocyptena microsoma*): Isla Partida, April 22, May 3, June 24; Georges Island, April 26, May 3.
6. Black Petrel (*Oceanodroma melania*): Isla Partida, April 22, May 3, June 24.
7. Red-billed Tropic-bird (*Phaëthon athereus*): Georges Island, April 26.
8. Blue-footed Booby (*Sula nebouxi*): Ildefonso, May 17.
9. Brewster Booby (*Sula brewsteri*): San Pedro Nolasco Island, April 17, May 3, June 24; Georges Island, April 26.
10. California Brown Pelican (*Pelecanus californicus*): San Pedro Nolasco Island, April 17; Isla Raza, April 21; Isla Partida, April 22; San Luis Island, April 28; Granite Island, May 2; Sal si Puedes, May 9; Ceralvo Island, June 6.
11. Man-o'-war-bird (*Fregata aquila*): San Francisco Island, May 29; Pelican Island, July 5.
12. San Lucas Great Blue Heron (*Ardea herodias sancti-luce*): Ceralvo Island, June 6.
13. Reddish Egret (*Dichromanassa rufescens*): San Luis Island, April 28; Angel de la Guarda, May 1; Granite Island, May 2.
14. Wilson Plover (*Ochthodromus wilsonius*): Pelican Island, June 30.
15. Frazar Oyster-catcher (*Hæmatopus frazari*): San Esteban Island, April 18; Isla Partida, April 22; Mejia, April 30; Santa Inez Island, May 13.
16. Valley Quail (*Lophortyx californica vallicola*): San Francisquito Bay, Lower California, May 10; Pt. Santa Antonita, May 16; Agua Verde Bay, Lower California, May 26.
17. White-winged Dove (*Mclopelia asiatica*): Las Animas Bay, Lower California, May 8; Carmen Island, May 21; Agua Verde Bay, Lower California, May 26; San Josef Island, May 28.

18. Turkey Vulture (*Cathartes aura septentrionalis*): Coronado Island, May 18; San Francisco Island, May 29; Angeles Bay, June 26.
19. Duck Hawk (*Falco peregrinus anatum*): Coronado Island, May 18.
20. Osprey (*Pandion haliaëtus carolinensis*): San Esteban Island, April 18; Tepoca Bay, Lower California, April 25; San Luis Island, April 28; Angel de la Guarda, May 1; Pelican Island, July 5.
21. Ash-throated Flycatcher (*Myiarchus cinerascens cinerascens*): San Pedro Nolasco Island, April 17.
22. Western Raven (*Corvus corax sinuatus*): San Pedro Nolasco Island, April 17; San Esteban Island, April 18; Mejia, April 30; Coronado Island, May 18; San Francisco Island, May 29; Angeles Bay, Lower California, June 26.
23. San Lucas House Finch (*Carpodacus mexicanus ruberrimus*): San Pedro Martir Island, April 18; San Marcos Island, May 11; Coronado Island, May 18; Carmen Island, May 21.
24. Western Chipping Sparrow (*Spizella passerina arizonæ*): San Pedro Nolasco Island, April 17.
25. Desert Sparrow (*Amphispiza bilineata deserticola*): San Pedro Nolasco Island, April 17; San Esteban Island, April 18; Angel de la Guarda, May 1; Coronado Island, May 18; San Josef Island, May 28; Ceralvo Island, June 6.
26. Green-tailed Towhee (*Oreospiza chlorura*): Angel de la Guarda, May 1.
27. San Lucas Cardinal (*Cardinalis cardinalis igneus*): Carmen Island, May 21; San Josef Island, May 28.
28. San Lucas Cactus Wren (*Heleodytes brunneicapillus affinis*): San Francisquito Bay, Lower California, May 10; Pt. Santa Antonita, May 16.
29. Tule Wren (*Telmatodytes palustris paludicola*): Patos Island, April 23.
30. Verdin (*Auriparus flaviceps flaviceps*): Angel de la Guarda, May 1; San Francisquito Bay, May 10.

31. Cape Verdin (*Auriparus flaviceps lamprocephalus*): Pt. Santa Antonita, Lower California, May 16; Danzante Island, May 24; Monserrate Island, May 25; Ceralvo Island, June 6.
32. Plumbeous Gnatcatcher (*Polioptila plumbea*): Puerto Escondido, Lower California, May 24.

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XXV
EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹

DIPTERA FROM THE ISLANDS AND ADJACENT
SHORES OF THE GULF OF CALIFORNIA

II. General Report

BY

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The first paper on the Diptera collected by Mr. Van Duzee in the region of the Gulf of California dealt with only one family, the Bombyliidæ; the species in this family were unusually abundant and a large percentage were new to science. But some of the other families of Diptera were well represented, especially the typical summer forms.

The material studied would tend to show that the insect fauna of this region is largely Sonoran and many species may be found ranging throughout the southwestern United States. Species taken on the mainland near Guaymas or on adjacent islands may have their center of distribution in tropical Mexico. The common house-fly is present throughout the region and there are some species represented which are wide-

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 8, of these Proceedings, copies of which can be supplied at nominal cost.

November 6, 1923.

spread in their distribution, such as: *Lipochæta slossona*, *Zodion fulvifrons*, *Chrysomyza demandata*, *Erax barbatus*, *Baccha clavata*, *Folucella esuriens*, and *Chrysomyia macellaria*.

The writer is indebted to Mr. C. W. Johnson for comparing certain specimens with determined material and for the donation of some named species which aided in naming related new forms. The Dolichopodidæ, Anthomyidæ, most of the Tachinidæ, and Ephydridæ and a few miscellaneous specimens remain to be reported upon. In a recent paper (ante pages 105-112) Mr. M. C. Van Duzee has described seven new species of Dolichopodidæ collected by the expedition, and Mr. J. R. Malloch has published (ante pages 425-428) a partial report on the Anthomyidæ and Lonchæidæ of the expedition.

CHIRONOMIDÆ

1. *Culiciodes* sp.

Several specimens were taken on San Esteban Island, April 20. As might be expected they were labelled "pests."

TABANIDÆ

2. *Apatolestes comastes* Williston

This common southwestern species was taken at Loreto, May 20.

3. *Tabanus punctifer* Osten Sacken

San José Island, June 10; Salinas Bay, Carmen Island, June 16.

4. *Tabanus rubescens* Bellardi

A series taken at Gonzales Bay, April 28. The writer was unable to place this species with certainty and specimens were sent to Mr. C. W. Johnson for determination.

STRATIOMYIDÆ

5. *Nemotelus wheeleri* Melander

Angeles Bay, June 26; Mulegé, May 15.

6. *Nemotelus canadensis* Loew

Two females taken on San José Island, June 10, probably belong to this species, although black in color instead of sub-ænescent and without the usual yellow line around the abdomen.

7. *Nemotelus rufoabdominalis* Cole, new species

Female: Length 5 mm. Head black, with short, appressed, silvery, tomentum-like pile. Face long and pointed, much as in *trinotatus*. Antennæ black, apices of first two joints red, compound third joint longer than the first two combined, the slender arista about as long (see fig. 1). Top of rostellum white and a white spot in front of each eye. Head rather flat and frons sloping. Proboscis black, bent slightly beyond the middle.

Thorax and scutellum shining black, with dense, appressed, silvery pile; pleura shining black, largely clothed with pile as on mesonotum. Humeri and lateral line white, widening at wing base. Halteres brownish at base, with pure white knob. Squamæ and its pile white.

Dorsum of abdomen largely orange in color, with a narrow rim of white; fifth tergite largely black; a white triangle on posterior margin of second and third tergites and a wider white spot on posterior margin of fourth. Venter colored much as on dorsum, but blackish brown around the outer margin. The minute white pile of the abdomen white. Two front pairs of legs missing. Hind coxæ and most of hind femora black, the apical third of femora yellowish; tibiæ with base and apex yellowish, the main part black; tarsi whitish. Wings whitish hyaline, the veins very pale; vein R_{2+3} furcate.

Type: Female, No. 1335, Mus. Calif. Academy of Sciences, collected by E. P. Van Duzee, April 25, 1921, at Tepoca Bay, Sonora.

The species runs to *trinotatus* in Melander's table of species (Psyche, X, p. 174, 1903), but differs in the orange red color of abdomen, in the outline of the frons and in the markings. The three other species having white triangles on the abdomen and the vein R_{2+3} furcate (*acutirostris* Loew, *wheeleri* Melander and *bellula* Melander) all have the abdomen black.

THEREVIDÆ

8. *Pherocera nigripes* Cole, new species

Female: Length 6 mm. Nearly allied to *albihalteralis* Cole. Head and appendages black. Face gray pollinose. Vertex, cheeks and occiput gray pollinose. Frons with shining black diamond-shaped spot taking up most of the space, the rest of the frons gray pollinose (see fig. 2).

Antennæ as in *P. signatifrons* Cole, first joint with black bristles and white pile. Palpi and cheeks with long white pile.

Thorax black, gray pollinose, with a brownish median vitta which is bisected by a fine white line; a dark long oval spot on either side of the median vitta. Pleura and coxæ gray pollinose. Scutellum gray pollinose, with sparse white pile. Stem of halteres yellowish brown, the knob whitish.

Abdomen black, basal half thinly gray pollinose, apical half shining. White pile on the basal four tergites, shorter black pile on the rest of the segments. Incisures of first, second, third, and fourth segments white, broadly on the second. Venter blackish, thinly gray pollinose. Genitalia typical of the genus, with no terminal circlet of spines. Legs black; basal half of anterior tibiæ white on front side and with white pile longer than the diameter of the tibiæ. Wings hyaline, the stigma pale brown. Venation as in *P. signatifrons*.

Type: Male, No. 1336, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 17, 1921, on San Pedro Nolasco Island.

This species differs from *signatifrons* in lacking the velvet black spots at base of antennæ, from *flavipes* in having black legs and from *albihalteralis* in the differently marked frons and the gray pollinose vertex. The venation varies little in the genus.

9. *Chromolepida mexicana* Cole, new species

Female: Length 7 mm. Nearly allied to *C. bella* Cole, probably averaging a little larger. First antennal joint about twice the length of the third, base yellowish brown. Face and frons almost the same as in *C. bella*. Upper occiput with white scales, the sides with greenish iridescent scales. Cheeks narrowly black, with short black pile. Occiput and palpi white pilose.

Thorax black, the mesonotum dulled by thin grayish brown pollen; disc with whitish scales except a double median vitta, sides with greenish scales. Pleura black, thinly gray pollinose. Mesopleura and upper sternopleura with dense, green iridescent scales, a few similar scales on the outer side of the coxæ. Hypopleura with a tuft of white pile. Knobs of halteres black, the stems paler. Scutellum black, with four black bristles and short whitish scales on the margin.

Abdomen shining black, faintly gray pollinose on first tergite. Narrow white incisures on second and third segments. Pile beyond the fourth segment short, black. Coxæ and trochanters black; femora, bases of front tibiæ, all other tibiæ except apices yellow. Most of front tibiæ, all of front tarsi, last three joints of other tarsi blackish brown. Wings whitish hyaline. Stigma and costal region of wing brown; cross-veins clouded brownish and portion of wing just back from margin gray, broader at the apex of the wing, very narrow along the posterior margin. Venation as in *C. bella*.

Type: Female, No. 1337, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 10, 1921, at **Guaymas, Sonora.**

This species differs from *bella* Cole in having black halteres, a differently marked thorax and scutellum and an entirely black abdomen.

10. *Psilocephala platancala* Loew

Guaymas, April 11.

11. *Psilocephala signatipennis* Cole

A variety of this species was taken at Mulegé, May 15.

12. *Psilocephala lateralis* Adams

Loreto, May 20, two males.

13. *Psilocephala tepocæ* Cole, new species

Female: Length 7.5 mm. Nearly related to *P. cinerea* Cole. Head, antennæ and mouth parts black. Frons with two round black spots next the eye margin a little above the level of the antennæ; above these spots the frons is gray pollinose, the lower frons and face white pollinose. Cheeks and occiput white pollinose and white pilose. Palpi with white pile. First joint of antenna shorter than third (see fig. 3), gray pollinose, with black bristles, the rest of the antenna black.

Thorax gray, light gray pollinose, a very broad brownish median stripe, a like-colored long oval spot on either side of this. Mesonotum mixed whitish and black pilose. Scutellum gray, whitish pilose, with four strong, black marginal bristles. Pleura and coxæ silvery gray pollinose and white pilose. Base of stem of halteres and base of knob brown, the rest pale yellowish.

Abdomen black, gray pollinose, the first four segments white pilose, the other segments with short, erect, yellow pile. Base of fifth and sixth segments semishining. Circlet of spines on genitalia yellowish. Most of tibiæ and two basal joints of tarsi yellow; femora, apices of tibiæ and first three tarsal joints and all of last two tarsal joints black. Wings gray hyaline, stigma dark brown; veins faintly and narrowly bordered gray.

Type: Female, No. 1338, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 25, 1921, at **Tepoca Bay, Sonora.**

There is one female paratype taken at the same time and place. The species does not have the legs and halteres black as in *baccata*, to which species it is related. It differs from *cinerea* Cole in having yellow pile on the posterior part of the

abdomen and in having cell M_3 widely open in the margin. The antennæ are proportionately broader and shorter than in *cinerea*.

14. *Thereva semitaria* Coquillett

San Francisquito Bay, May 10; Tepoca Bay, April 25.

SCENOPINIDÆ

15. *Scenopinus nubilipes* Say

A male and female, taken at Mejia Island, April 30.

16. *Pseudatrachia insulana* Cole, new species

Male: Length 2.75 mm. Eyes holoptic; frontal triangle small, yellow. Face, cheeks and outer portion of occiput yellow. Ocellar tubercle brown. First joint of antennæ brown (the rest broken off in specimen).

Mesonotum black, gray pollinose, the humeri and lateral stripe yellow; some yellow on prescutellar callosities. Disc of scutellum black, gray pollinose, the broad margin yellow. Viewed from above there are three grayish brown thoracic vittæ, a narrow median one and two wider ones; outside the wider stripes there are dark spots just above the lateral line. Pleura largely black, gray pollinose, but with some yellow marks, as on the propleura, upper sternopleura and wing base. Stem of halteres brown, the knob white.

Abdomen shining black, with white lateral margins on tergites and broad posterior margins on second, third, fourth, fifth and sixth tergites. Pile of abdomen sparse and white. Hypopygium large, about one-fourth as long as rest of abdomen, brown at base, the outer part of styles whitish (see fig. 4). Femora, apical portion of tibiæ and the tarsi blackish brown; knees yellow; basal portion of front two pair of tibiæ brown, hind pair largely yellowish. Wings whitish hyaline; first section of radius about as long as the second, the second about equal to the fourth.

Female: Length 5.8 mm. Differs from the male mainly in darker color of head and much longer abdomen. First antennal joint buried in head, second joint brown, third joint about twice as long as second (see fig. 5), brown, yellowish at base. Frons almost as broad as eye, dull yellowish brown. Occiput, face and mouthparts colored as is frons. Wings reaching to middle of fifth abdominal segment. First four abdominal segments black and marked as in male, the segments beyond reddish brown, the incisures paler but not white.

Type: Male, No. 1339, and *allotype*, female, No. 1340, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 21, 1921, on Isla Raza, Gulf of California.

Pseudatrachia unicolor Coquillett, *pilosa* Coquillett and *flaviceps* Coquillett have the scutellum entirely black; *P.*

longurio Loew and *griscola* Coquillett have the scutellum partly yellow, but the former has the head and abdomen black and the latter is generally yellowish or brown in coloration.

ASILIDÆ

17. *Leptogaster* sp.

A single male about 11 mm. in length was taken by Mr. Van Duzee at San Francisquito Bay, May 10. The specimen is somewhat greased. The empodia are present and the anterior intercalary vein forms a distinct angle with the portion of the posterior cross-vein that closes behind the second posterior cell. The color of the body is evidently blackish brown, with reddish pleura, humeri, and yellowish cross bands on abdomen. Hind femora largely black, with short silvery pile below on swollen part much as in *hirtipes*. The antennæ are blackish brown.

18. *Stenopogon mexicanus* Cole, new species

Male: Length 23 mm. A brown and flesh-colored species, densely covered with gray and yellow pollen. Apex of first antennal joint and all of second joint red, the rest of antennæ black; third joint rather slender oval, scarcely as long as the first and second combined, the style slender and almost as long as the third joint. Pollen on face white, on cheeks and oral margin yellowish brown. Mystax, oral bristles, pile of palpi and beard white. Bristles and pollen of vertex yellowish. Proboscis and palpi black.

Ground color of thorax flesh-colored, the bristles and pile white or pale yellow. Mesonotum with median bisected dark brown stripe, the dividing line of golden pollen; an indistinct shorter stripe on either side. A group of bristles in front of scutellum; prescutellar callosities with white bristles. Pleura and coxæ largely silvery pollinose. Hypopleura with strong tuft of white bristles and hairs, the mesopleura with white pile. Knob of halteres reddish, the stem yellow. Scutellum golden yellow pollinose, with erect white pile and bristles.

Abdomen rather long and slender, ground color as on thorax, largely obscured by yellowish gray pollen. A rather narrow median blackish brown stripe on the first six tergites; on each side of the tergites near the base is a spot which in certain lights is brown. Genitalia flesh-colored, the cerci brown; styles rounded and reaching beyond hypandrium (see fig. 6). Legs reddish yellow, the inside and front of femora black; front of tibiæ with some black, especially the hind pair. Legs dense white pilose, the bristles white. Wings yellowish hyaline, veins black, the costa with a white fringe, quite noticeable at the base. Cell R_5 wide open, M_3 (fourth posterior) closed.

Female: Length 20 mm. Very nearly like the male; abdomen more slender, the median stripe more distinct and continued on the seventh segment. Eighth segment and ovipositor shining black.

Type: Male, No. 1341, and *allotype*, female, No. 1342, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 10, 1921, at **Guaymas, Sonora**.

On account of the pile on the hypopleura and the shape of the third antennal joint and style this species would run to the last couplet in Back's table of species (Trans. Amer. Ent. Soc., 1909, XXXV, 192), but differs from *helvolus* Loew and *picticornis* Loew in color and markings and in having cell M_1 (first posterior) open in margin.

19. *Saropogon coquilletti* Hine

Patos Island, April 23.

20. *Saropogon semiustus* Coquillett

Tepoca Bay, April 25.

21. *Lissoteles vanduzeei* Cole, new species

Male: Length 6-7 mm. A small black species, densely covered with silvery gray pollen. Antennæ black, thinly gray pollinose, first, second, and third joints about equal in length, the slender black style almost as long as these three joints together (see fig. 7). All pile of head and the orbital bristles white, the pile on the frons sparse. Face gently convex, with a dense shining white mystax that reaches in a narrowing triangle to the base of the antennæ. Palpi and proboscis black.

Median portion of mesonotum less thickly pollinose, semishining. All pile and bristles of thorax and scutellum white. Pile of mesonotum quite numerous. Scutellum thickly covered with erect white pile. Squamæ whitish. Halteres brown at base, with a yellow stem and knob.

Abdomen black, the posterior half of tergites 2-8 more thinly pollinose than the rest of the dorsum and semishining grayish black. Abdomen quite thickly white pilose, the pile longer at base and becoming very short on hypopygium, which is dense gray pollinose. Epandrium slit about half way to base in middle (see fig. 8). A patch of long white bristles on the posterior angles of the first tergite. Venter gray pollinose and quite thickly white pilose. Legs black, the femora and tibiæ gray pollinose, all the pile and bristles white. Claws largely black, red at base, the pulvilli dull yellowish white. Bristles of front tibiæ and tarsi very long. Wings hyaline, the veins at base of wing yellow, the rest black. Venation as in species of *Neopogon*.

Female: Length 6-10 mm. Same as the male in most characters. Mesonotum with more pollen. Abdomen wider and more densely polli-

nose on dorsum, only posterior margins of segments semishining. Cirlet of spines at tip of abdomen yellowish white and blunt. Pile of abdomen short, erect, white and quite dense, longer on the sides of first and second segments.

Type: Male, No. 1343, and *allotype*, female, No. 1344, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 7 and May 10, 1921, at **Angeles Bay** and San Francisquito Bay, Lower California.

There is a large series of paratypes in the collection of the California Academy of Sciences taken from May 7 to June 6 in the following localities other than those mentioned above: Ceralbo Island, Monserrate Island, Coronados Island, Loreto, and Agua Verde.

The genus *Lissoteles* was established by Bezzi (Boll. del Lab. di Zool. gen. e agr. etc., IV, p. 177) in 1910 for a new species, *L. hermanni*, taken at Panama. The genus *Neopogon* was created by Bezzi for the North American species formerly placed in *Stichopogon*, one of the distinguishing characters being the presence of only one supra-alar bristle. The genus *Lissoteles* is allied with *Neopogon* in this respect and in most other characters. The antennæ are quite different and in the above new species the style is comparatively much longer than in *hermanni*. The species is further distinguished by the dense white mystax reaching to the base of the antennæ, thus differing from all species of *Neopogon* and *Stichopogon*, as well as from the only other species of the genus *Lissoteles*.

22. *Proctacanthus arno* Townsend

Escondido Bay, June 14. A rather small male collected at La Paz, June 4, may prove to be a distinct species.

23. *Erax anomalus* Bellardi

San Pedro Bay, July 7; San Carlos Bay, July 8.

24. *Erax coquilletti* Hine

Patos Island, April 25.

25. *Erax latrunculus* Williston

Guaymas, April 10, 12.

26. *Erax unicolor* Bellardi

Guaymas, April 11.

27. *Erax barbatus* Fabricius

Mulegé, May 14; Escondido Bay, June 14; Agua Verde, May 26; Las Animas Bay, May 8; Loreto, May 20; La Paz, June 4.

28. *Erax productus* Hine

Three male specimens answer the description of this species. One was taken on Cerralbo Island, June 6, the others on Tortuga Island, May 11 and June 22. The type locality is Lakeside, Calif. The mesonotum is more or less compressed laterally and has short but quite noticeable black pile. There is a metallic glint to the mesonotum. A small female from Tiburon Island, July 4, may belong to this species.

29. *Erax* sp.

Two female specimens taken on San Francisco Island, May 30, probably belong to an undescribed species. They are in the *stramineus* group.

30. *Erax* sp.

One female taken on Tiburon Island, April 23, belongs to the *stramineus* group but cannot be definitely placed without males. It is near *coquilletti* Hine. A female from Isla Partida, May 3, is near this species.

31. *Erax* sp.

Two females taken at Guaymas, April 10 and 14 belong to the *stramineus* group, but cannot be determined without males.

32. *Asilus* sp.

Two females of a very large species taken at Las Animas Bay, May 8, would run to *astutus* Will. in Hine's table (Annals Ent. Soc. Amer., vol. II, 1909), but are 23 mm. in length and differ in certain other characters. The species is gray pollinose, without strong spines at the tip of the ovipositor. Femora and tibiae black. Wings hyaline, with a faint brownish yellow cloud in the middle.

33. *Mallophora guildiana* Williston

Pond Island Bay, June 30.

PIPUNCULIDÆ

34. *Pipunculus sonorensis* Cole, new species

Male: Length 3 mm. Frons narrow, extending slightly over half way to posterior eye margin, silvery pollinose. Eyes touching for a very short space, the ocellar triangle narrow and black. Face silvery pollinose, slightly narrowing toward oral margin. Antennae blackish brown, third joint long and acuminate, paler on apical half, with a black arista. Occiput black, sides thinly silvery pollinose.

Mesonotum and scutellum black, thinly gray dusted, oval in outline; humeri pale. Postnotum gray pollinose. Pleura black, gray pollinose. Part of stem of halteres brown, the knob yellowish white.

Abdomen black, thinly gray dusted, oval in outline; pile sparse, pale, a few larger hairs at base of first segment. Hypopygium as long as fifth segment, slender, asymmetrical, largely developed on right side.

Legs black, the apices of femora and narrow bases of tibiae yellow. Hind femora unarmed, the trochanters with a large, blunt, yellowish tooth (see fig. 9). Hind tibiae strong, the first tarsal joint slender. Wings hyaline, the stigma hyaline. Space between apex of subcostal vein and R_1 about half that between R_1 and R_{2+3} . Small cross vein about middle of cell 1st M_2 and beyond apex of R_1 . Last section of M_{1+2} (fourth vein) distinctly sinuate.

Type: Male, No. 1345, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 25, 1921, at **Tepoca Bay, Sonora**.

The species belongs to the *subvirescens* group and in Cresson's table of species would run to *unguiculatus*; but there are several differences, notably the difference in shape of the tooth on the posterior trochanters.

SYRPHIDÆ

35. *Volucella esuriens* Fabricius
Agua Verde, May 26; Las Animas Bay, May 8.
36. *Volucella isabellina* Williston
Loreto, May 20; Angeles Bay, May 4, 5, and June 25.
37. *Volucella isabellina* variety
Tiburon Island (Bay at south end), July 5.
38. *Volucella megacephala* Loew
Angeles Bay, May 7.
39. *Copestylum estebana* Townsend
San Francisquito Bay, May 10 and June 23.
40. *Copestylum limbipennis* Williston
Angeles Bay, June 25, 26.
41. *Nausigaster unimaculata* Townsend
Angeles Bay; San Evaristo Ranch, June 10; San José
Island, May 28, 29; Guadalupe Pt., Concepcion Bay, June 17;
San Esteban Island, April 19.
42. *Baccha clavata* Fabricius
Guaymas, April 13, 15; San Lorenzo Island, June 25; San
Francisquito Bay, May 10; San Evaristo Ranch, June 10.
43. *Baccha lemur* Osten Sacken
Agua Verde, May 26.
44. *Mesogramma parvula* Loew
Mulegé, May 14, 15.

45. *Mesogramma marginata* Say

Mulegé, May 14.

46. *Allograpta obliqua* Say

San Evaristo Ranch, June 10; Espiritu Santo Island, June 9; Santa Catalina Island, June 12; Mulegé, May 14.

47. *Eupeodes volucris* Osten Sacken

Loreto, May 20.

CONOPIDÆ

48. *Conops sylvosus* Williston

La Paz, June 3, 5.

49. *Physocephala affinis* Williston

La Paz, June 3, 4; Angeles Bay, May 7.

50. *Zodion pygmæum* Williston

Loreto, May 20; Guaymas, April 10, 11; Mulegé, May 15.

51. *Zodion fulvifrons* Say

Las Animas Bay, May 8; La Paz, June 5. A series of six females taken, all very pale in general coloration but with dark legs.

52. *Zodion* sp.

Mulegé, May 15; La Paz, June 3; Guaymas, April 7. One specimen was taken in each locality, all being males. It is a dark colored species, with white thoracic vittæ and white spots on the abdomen. The species is probably undescribed.

TACHINIDÆ

53. *Myiophasia robusta* Coquillett

Mulegé, May 14. This and the following three species are only a small part of the Tachinidæ taken on the expedition. A number of species are apparently undescribed, and the family will be reported on in a later paper.

54. *Linnæmyia compta* Desvoidy

Las Animas Bay, May 8; Mulegé, May 14.

55. *Archytas analis* Fabricius

La Paz, June 3, 5.

56. *Archytas aterrima* Desvoidy

La Paz, June 3, 4; Guaymas, April 7.

MUSCIDÆ

57. *Musca domestica* Linnæus

The house-fly is probably distributed over most of the territory visited by the expedition. There are specimens in the collection from Guaymas, April 7, 15 and Santa Cruz Island, May 27.

58. *Chrysomya macellaria* Fabricius

San Pedro Nolasco, April 17; Espiritu Santo Island, June 9; San José Island, May 29; Angeles Bay, May 5, 7 and June 15, 26; Pond Island Bay, July 1; Granite Island, May 2; Santa Cruz Island, May 27; Guaymas, April 7, 15; San Evaristo Ranch, June 10; Mulegé, May 14; Danzante Island, May 24; Coyote Bay, June 18.

PHYCOPROMIDÆ

59. *Cœlopa anomala* Cole, new species

Male: Length 6.25 mm. A rather pale colored species with strong bristles on abdomen and legs. Head reddish in ground color, paler across the middle of the frons, which is gently convex. The ocellar

triangle and most of occiput gray pollinose. Antennæ reddish brown, first joint scarcely visible, the second about as long as the third, with a long backwardly directed bristle on anterior margin and a shorter bristle directed forward, also several very short, black bristles; third antennal joint broadly rounded, the arista very slender and a little longer than antenna. Cheeks with rather short bristles and vibrissæ.

Thorax not as flat and wide as is usual for the genus, being almost as convex as in some Scatophagidæ, dark brown or gray in ground color, the mesonotum and scutellum densely gray pollinose, with rather short black bristles on most of the surface, a median row distinct and a row on either side as in other species of the genus. Scutellum with two pairs of long bristles, the apical pair close together at base and cruciate. Pleura gray pollinose, with some black pile and bristles. One long mesopleural bristle just in front of the wing base. Halteres yellowish, the knob slightly infuscated. A pair of long bristles on mesonotum just in front of scutellum.

Abdomen gray, with posterior portion of tergites 2-5 dull yellowish. Abdominal segments beyond fifth dark brown, the genitalia small and folded under, the genital styles yellow. Dorsum of abdomen with numerous long black bristles, mostly directed toward apex.

Legs shining yellowish brown, the pulvilli appearing white on account of the dense microscopic white pile. Femora with numerous black bristles and some black pile; bristles of front femora very long and slender; anterior surface of middle femora with a row of seven strong bristles on distal half, six of them rather short, heavy and blunt. Tibiæ with black bristles and pile, the middle tibiæ with a large blunt apical bristle and a similar one just above it. Tarsi with black pile, especially long and dense on the two hind pair. Wings grayish hyaline, tinged with yellow along the veins; costa subcosta and radial veins yellowish, the other veins brown. Stigma yellowish. Epaulet at base of wing with a rather long black bristle.

Female: Length 6 mm. Very nearly like the male. Bristles of the head shorter. Abdomen much broader than in male, black, thinly gray dusted, with rather short, thin black pile on dorsum. Legs much more slender than in male, lighter colored, with no heavy bristles on femora. Posterior tibiæ with one long, very slender preapical bristle on the dorsal surface.

Type: Male, No. 1345, and *allotype*, female, No. 1346, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 8, 1921, at Las Animas Bay, Lower California. *Paratype:* One female, taken at Puerto Refugio, Angel de la Guardia Island, May 1, 1921.

This species is placed in *Cœlopa* for the time being, but it possesses characters which might well exclude it from that genus. *C. frigida* Fall. has no mesopleural bristle and the mesonotum is much flattened and rectangular; it has no long pile on the middle tarsi of the male. *C. frigida* Fall. and

parvula Hal. do not have long bristles on the dorsum of the abdomen in the male. *C. parvula* has no heavy bristles on the femora and no mesopleural bristle.

SAPROMYZIDÆ

60. *Camptoprosopella verticalis* Loew

Guaymas, April 11; Mulegé, May 14.

TRYPETIDÆ

61. *Euaresta bellula* Snow

Guaymas, April 11; Puerto Refugio, May 1; San Lorenzo Island, May 9; Mulegé, May 15.

62. *Urellia mevarna* Walker

San Francisquito Bay, May 10; Mulegé, May 14; San Nicolas Bay, May 16; San Lorenzo Island, May 9; San Pedro Martir Island, April 18.

63. *Plagiotoma obliqua* Say

San Pedro Martir Island, April 18.

64. *Cedaspis minuta* Snow

Puerto Ballandra, May 22.

65. *Eurosta pallida* Cole, new species

Male: Length 3.5 mm. Frons, face, antennæ, palpi, proboscis, and occiput yellow. Bristles of frons brown. Oral opening large, the margin somewhat produced. Third antennal joint slightly concave above; arista yellow at base, blackish toward tip. Bristles back of vertex white.

Mesonotum brown, gray pollinose, the humeri and lateral margins yellow; the pile yellowish and bristles brown. Scutellum pale yellow, with four brown bristles. Much of pile on mesonotum bristle-like, a conspicuous clump on the humeri. Metanotum brown. Pleura yellowish; two strong mesopleural bristles, one pteropleural and one sternopleural. Halteres yellow.

Abdomen largely brown on dorsum, yellowish on most of first and all but two large spots on second; base of third tergite yellowish; Venter and genitalia yellowish.

Legs wholly yellow, the tips of claws black. Wings almost as broad and rounded as in some species of *Eutreta*, gray (probably teneral), with base, apex, and many spots whitish hyaline (see fig. 10). Some of the wing spots are quite large; veins mostly pale; first vein bristly along whole length, third with a few bristles at base.

Type: Male, No. 1347, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 10, 1921, at **San Francisquito Bay, Lower California.**

The type is the only specimen collected. The species is doubtfully placed in this genus, the frons not being much wider than long. The wing markings suggest *E. soladaginis* Fitch, but the base of the wing is more hyaline. In *E. reticulata* Snow, *fenestrata* Snow and *conspurcata* Doane there are fewer hyaline spots in the wings.

66. *Baryplegma maculipennis* Cole, new species

Female: Length 4 mm. Frons, occiput and mouth parts pale yellow, the antennae darker; face whitish yellow. Bristles of frons and vertex brown, other bristles and pile of head whitish yellow. Third antennal joint about as long as basal joint, rounded at tip; arista yellowish at base, the larger portion brown.

Central portion of mesonotum black in ground color, yellowish red on the margins, largely golden pollinose and with dense, appressed, bristle-like pile of yellowish color. Scutellum pale yellow, with short pile as on mesonotum and four long brown bristles. Upper pleura yellowish red, the rest black in ground color, gray pollinose. Postnotum black, gray pollinose. Halteres dark yellow.

Abdomen clear reddish in color (more or less crushed in type specimen), with pale bristles; ovipositor reddish. Legs bright yellow, with yellow pile and bristles; a row of five strong bristles below on front femora. Wings with yellow, gray, and black markings and numerous hyaline spots (see fig. 11); nearly all of the hyaline spots are bordered with dark gray or blackish brown. Small cross-vein distinctly beyond middle of cell 1st M_2 . Vein R_4+5 bristly nearly whole length, nearly parallel with M_{1+2} , both slightly arcuate.

Type: Female, No. 1348, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 6, 1921, on **Ceralbo Island, Gulf of California.**

Only one specimen was taken. The species might be placed in the genus *Tephritis*, but it is certainly allied to *Baryplegma gilva* v.d.W. from Mexico, the only other species in the genus. The new species has much less yellow on the wings, the posterior portion and tip having gray markings with no

yellow; some markings on the anterior margin are almost black. The general arrangement of the hyaline spots suggests *gilva*.

ORTALIDIDÆ

67. *Notogramma purpurata* new species

Male: Length 4.5 mm. Differs from *N. stigma* in color and markings. Antennæ light brown, darker on the very small first joint. Most of frons shining purplish red, the ocellar triangle and lateral stripes metallic green. Face and clypeus dark metallic green, the cheeks reddish brown. Occiput metallic greenish black.

Mesonotum marked with black stripes which are composed of black dots with a microscopic hair on each; color between stripes greenish and coppery. Pleura dark metallic green, with some white pollen on propleura. Scutellum metallic coppery green.

Base and central portion of dorsum of abdomen dark metallic green, the wide margin bright purple. Hypopygium green. Apical third of femora and most of tibiæ reddish; first two joints of posterior and middle tarsi, basal part of third and all except apex of front metatarsi yellow, the rest of tarsal joints black. Wings a little more pointed than in *stigma* (see fig. 12).

Female: Practically the same as the male.

Type: Male, No. 1349, and *allotype*, female, No. 1350, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 25, 1921, on **Monserrate Island, Gulf of California**. *Paratypes*: Four males taken in type locality, three taken with types and one taken on May 29.

This is the second species described from North America. The type locality of *N. stigma* is Cuba. In *N. stigma* the ocellar triangle and frontal stripes are steel blue and there is a tendency for the two vittæ each side of the median line to fuse; the mesopleuræ are pruinose and black dotted. In the new species there are fewer wing spots.

68. *Euxesta notata* Wiedemann

Specimens were taken on Monserrate Island, May 25 and on San José Island, May 29.

69. *Anacampta latiuscula* Loew

Angeles Bay, June 26.

70. *Diacrita costalis* Gerstaecker

Montserrat Island, May 25.

71. *Chrysoomyza demandata* Fabricius

A series of seventeen specimens taken at Guaymas, on April 6, 10, and 15.

72. *Acrosticta tepocæ* Cole, new species

Male: Length 5mm. Head black, the frons and face gray pollinose, the upper occiput gray pollinose, the cheeks and lower occiput shining. Frons nearly smooth, with few short black pile and bristles, parallel sided. Antennæ black, the third joint rather large and oval (see fig. 13), nearly the basal third of arista swollen. Clypeus distinct, black, not projecting forward. Palpi and proboscis shining black.

Thorax and scutellum bluish green, metallic, but dulled by grayish white pollen, denser on mesonotum. Scutellum rounded, convex, with four black bristles. Squamæ snow white. Halteres whitish.

First three segments of abdomen scarlet, the base of first tergite with a tinge of metallic green, the rest of abdomen dark metallic, semishining green; fourth segment as long as second and third combined; green portion of abdomen minutely granular. Femora blackish green, the rest of legs black. Wings hyaline, with costal cell and stigma brown; a large brown spot at apex of wing, much as in other species of genus (see fig. 14); vein R_{2+3} bowed upward, R_{4+5} bowed slightly downward.

Female: Very nearly like the male. Third antennal joint shorter and broader. Fourth abdominal segment about as long as third, thus much shorter than in male. Ovipositor quite wide at base and largely greenish black.

Type: Male, No. 1351, and *allotype*, female, No. 1352, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 25, 1921, at Tepoca Bay, Sonora. *Paratypes*: Five males and one female, taken with the types.

This species and the following are closely related to *bicolor* Cresson and differ slightly from the typical species of the genus. This species differs from *dichroa* Loew in having white halteres instead of brown and in having a smooth, pollinose frons; the wing markings are about the same. The legs are not partly red as in *bicolor* and the frons and abdomen differ. The wing and head differ from *foveolata* Loew. In *A. fulvipes* and *rufiventris* the head is red. The wing is not like that of *ruficauda* Hendel and both wing and head differ from *scrobiculata* Loew.

73. *Acrosticta mexicana* Cole, new species

Male: Length 5mm. This species is near the preceding but has the antennæ wholly yellow, the third joint shorter and broader (see fig. 15); and the whole head yellowish, shading to brown on the cheeks. Palpi yellow with short black pile. Frons pale yellow in front, grayish yellow on upper part. Ocellar tubercle and a small mark on each side next the eye, black. Upper occiput black, thinly gray pollinose, the lower part yellow.

Thorax black, with blue-green and purple reflections showing through the thin gray pollen. Scutellum blue-green, the apex rather pointed.

Basal three segments of abdomen short, yellowish red, the three segments together about as long as the fourth; segments beyond third dark green, semishining. Pile of abdomen short and black.

Legs reddish in color, the hind pair darker. Wings yellowish gray hyaline, the apical spot small. Costal cell and stigma brown, as are the veins inclosing them, the rest of the veins yellow, except at wing tip and outer side of cell 1st M_2 .

Female: Same as male. Red of abdomen extended to most of fourth segment; ovipositor wide at base and black.

Type: Male, No. 1353, and *allotype*, female, No. 1354, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 25, 1921, at Tepoca Bay, Sonora. *Paratypes:* Three males and seven females, taken with the type specimens.

The species differs from the preceding new species, from *âichroa*, and from *bicolor*, in having a yellowish head and yellowish and brown legs. The apical wing spot is larger than in *foveolata* and there are other differences. *A. rufiventris* Hendel has the frons broader behind and the abdomen wholly blood red; *fulvipes* has no red color on the abdomen.

74. *Ulidia rubida* Loew

San Marcos Island, June 19; San José Island, May 29; Pond Island Bay, June 30.

MICROPEZIDÆ

75. *Nerius flavifrons* Bigot

There are specimens from Isla Partida, April 22, and from Porto Ballandra, Carmen Island, May 21, bred from cactus by J. C. Chamberlin. One teneral specimen was determined by C. W. Johnson. There is some doubt as to the placing of the species as the original description is rather incomplete and does

not mention the numerous black dots on the pleura, coxæ, mesonotum, and segments two to six of abdomen.

76. *Micropeza flaviventris* Cole, new species

Female: Length, excluding ovipositor (2.5 mm.) 7 mm. Frons shining brown, a little paler on sides, ocellar tubercle blackish. Face, cheeks, and mouth parts yellowish. Antennæ yellowish, darker above, with a pale arista. Occiput greatly developed (see fig. 16); the upper and lower occiput brown, a median stripe on sides yellow.

Pronotum yellowish brown, the humeral angles pale. Mesonotum brown in ground color, densely gray pollinose, with two narrow brown vittæ on each side of median line, more or less obscured back of transverse suture; a lateral brown mark, interrupted at suture. Scutellum gray pollinose, with a pair of erect black bristles. Pleura brown, yellowish around wing base, silvery gray pollinose. Halteres largely white, the stem and tip of knob brown.

Dorsum of abdomen black, second to sixth tergite with yellow posterior margins; the venter yellow. Ovipositor about as long as abdomen, the two segments about equal, first segment yellowish brown shining, the second largely brown, blackish at base. Femora honey-yellow, the apices with a faint brown ring; tibiæ yellowish, brown at base and apex; tarsi wholly black; hind tibiæ almost a third longer than middle tibiæ. Wings yellowish hyaline; R_{4+5} and M_{1+2} meeting just before wing margin (apical cell closed in margin); cell 1st A cut off square at apex.

Type: Female, No. 1355, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 15, 1921, at Mulegé, Lower California. *Paratypes:* Two females, taken with the types.

The species would run to *nigricornis* in Cresson's table of species (Trans. Amer. Ent. Soc., XXXIV, p. 2, 1908) and to *bilineata* v.d.W. in the table given in the Biologia. The first species is smaller and has black antennæ, the second is very near the new form but has two white spots near the ocelli, basal antennal joint black, and femora with apex and two rings black.

EPHYDRIDÆ

77. *Ephydra millbræ* Jones

Angeles Bay, May 6.

78. *Ephydra viridis* Hine

San Carlos Bay, July 8.

79. *Ephydra gracilis* Packard

San Carlos Bay, July 8; San José Island, June 10. A series of 38 specimens taken.

80. *Lipochæta slossonæ* Coquillett

Loreto, May 19; Isla Partida, April 22. A series of 40 specimens taken on kelp by the tide line.

81. *Paralimna decipiens* Loew

Mulegé, May 14 (on beach); Loreto, May 19. Several specimens.

82. *Gymnopa tibialis* Cresson

Mulegé, May 14 (on beach); Pond Island Bay, June 30, July 1; Las Animas Bay, May 8; Guaymas, April 11; Angeles Bay, May 5. A series of 30 specimens collected.

OSCINIDÆ

83. *Meromyza americana* Fitch

Mulegé, May 15.

AGROMYZIDÆ

84. *Agromyza æneiventris* Fallén

Guaymas, April 11.

85. *Agromyza* sp.

One teneral specimen taken on San Esteban Island, Gulf of California, April 19, is near *simplex* Loew.

86. *Tethina spinulosa* Cole, new species

Male: Length 3mm. Vertex and most of occiput black, gray pollinose. Frons yellowish. Two pairs of proclinate ocellar bristles, the postverticals wider apart and directed forward and out like the ocellars; three

long fronto-orbitals directed outward and six smaller bristles almost erect. Three pairs of proclinate frontal bristles. First two antennal joints yellow, a good sized bristle above on first; third joint yellowish brown, longer than rest of antennæ and broadly rounded; arista about length of antenna, blackish brown, microscopically pubescent. Face and cheeks yellow, thinly dusted with silvery white pollen. Bristles on oral margin strong, the vibrissæ not differentiated. Face gently concave, the oral margin projecting. Palpi whitish yellow with a few black bristles. Proboscis largely yellow.

Mesonotum, scutellum, pleura and coxæ black in ground color, densely gray pollinose; two faint gray vittæ on mesonotum, narrowly separated. Mesonotum with many black bristles which are almost as strong as the dorso-centrals. Two pair of strong scutellar bristles. One propleural bristle; several mesopleural bristles, four large ones along the posterior margin; several sternopleural bristles, one on upper posterior corner large; rest of pleura bare. Stem of halteres yellow, the knob white.

Abdomen blackish gray in ground color, gray pollinose, the segments with posterior margins yellowish; dorsum covered with quite large black bristles. Hypopygium rather small, black, gray pollinose, curving under and inclosing genitalia. Femora blackish gray, gray pollinose; last two tarsal joints brown, the rest of legs yellowish brown. Legs densely covered with black bristles, except the hind metatarsi which are paler in color and with short, dense, silvery white pile below. Wings whitish hyaline, with yellow veins; costal setulæ black; posterior cross-vein curving inward.

Female: Nearly the same as male. Bristles of most of dorsum noticeably smaller. Apical segments of abdomen very small, the cerci rather long, slender, yellowish.

Type: Male, No. 1356, and *allotype*, female, No. 1357, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 8, 1921, at Las Animas Bay, Lower California. *Paratypes:* Numerous specimens from the type locality and from Loreto, May 19, 20; Sal Si Puedes Island, May 9; San Francisquito Bay, May 10.

In *T. parvula* the posterior cross-vein is shorter and straight, the bristles of mesonotum, pleura, and legs much smaller; the cheeks and face much whiter and there are four pair of smaller frontals. *T. albula* is a smaller species and is largely dense white pollinose, with whitish bristles, the cheeks much broader.

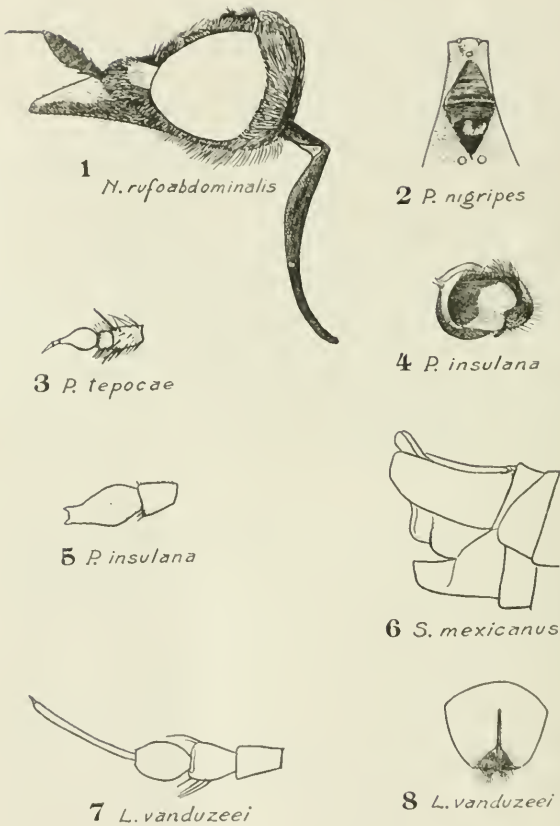
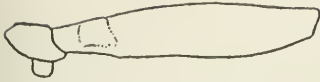
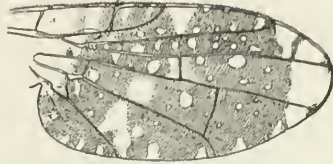


Fig. 1. *Nemotelus rufoabdominalis* Cole, head; fig. 2, *Pherocera nigripes* Cole, frons; fig. 3, *Psilocephala tepocae* Cole, antenna; fig. 4, *Pseudatrachia insulana* Cole, hypopygium; fig. 5, same, antenna; fig. 6, *Stenopogon mexicanus* Cole, genital segment, lateral view; fig. 7, *Lisstoteles vanduzeei* Cole, antenna; fig. 8, same, epandrium.



9 *P. sonorensis*



10 *Eurosta pallida*



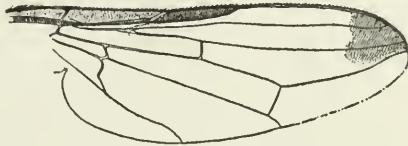
11 *B. maculipennis*



12 *N. purpurata*



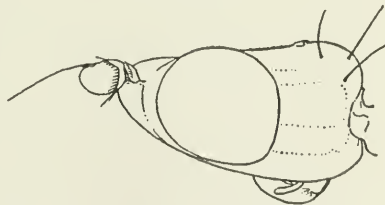
13 *A. tepocae*



14 *A. tepocae*

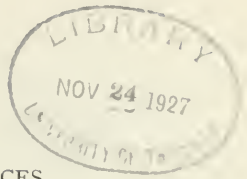


15 *A. mexicana*



16 *M. flaviventris*

Fig. 9. *Pipunculus sonorensis* Cole, hind trochanter and femur; fig. 10, *Eurosta pallida* Cole, wing; fig. 11, *Baryplegma maculipennis* Cole, wing; fig. 12, *Notogramma purpurata* Cole, wing; fig. 13, *Acrosticta tepocae* Cole, antenna; fig. 14, same, wing; fig. 15, *Acrosticta mexicana* Cole, antenna; fig. 16, *Micropeza flaviventris* Cole, head, lateral view.



PROCEEDINGS
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XXVI
EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921*

LAND AND FRESHWATER MOLLUSKS

BY

G. DALLAS HANNA

Curator of Invertebrate Paleontology

The southern end of the Peninsula of Lower California, known as the "Cape Region", has long been known for its remarkable land-snail fauna. The species are probably all confined to the region but several of them bear a striking similarity to forms found in Peru. Whether this indicates a closer connection, either directly by land or through favorable ocean currents, than has ever existed with the mainland of Mexico close by, is a problem which will bear careful study.

The first species made known to science from Lower California reached European conchologists many years ago without definite locality data. The peculiarities of the fauna were not suspected until the collection made by John Xantus de Vesey in 1860-61 reached the hands of W. G. Binney. He described several striking species and recognized the Peruvian affinities of others.

The remainder of our knowledge of this branch of science is largely due to the efforts of members of expeditions sent out

*A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

December 31, 1923

at various times by the California Academy of Sciences. The collections were studied by Cooper and Dall and several papers were published on the results.

But all of the collections together heretofore made probably constitute but a small part of the wonderful series brought back by the expedition of 1921. This resulted from the untiring efforts of every member of the party. The expedition visited a great many localities from which land shells had not before been secured and, because work was chiefly confined to the islands of the Gulf of California, many novelties were found. The Cape Region, so rich in species of *Bulimulus*, was not visited, but in 1919 Mr. Joseph R. Slevin travelled extensively there and brought back numerous specimens of some of the better known species. The results of that work are incorporated herein.

The work of identification has been made much less laborious by having the magnificent collection of the late Henry Hemphill for consultation and reference. He had been able to secure authentic specimens of most of the better known species through his close friendship with many of the older conchologists.

Genus *Bulimulus* Leach

The species of this genus which live in Lower California and on the islands of the Gulf fall into a natural group which is characterized by a heavily costulate nucleus, and in anatomical detail. A subgenus, *Orthotomium* Cross & Fisher, with *B. sufflatus* as type, has been made for the group.¹ Shape and size vary within most diverse limits but nuclear characters seem to remain constant; it argues for a common ancestry and a very long isolation. The species of the islands are related only to nearby peninsular forms and in no case to those of the mainland of Mexico. The genus was not found on the northern islands of the Gulf from which may be inferred that these have not had a recent connection with the more southern ones of the Cape Region.

The fauna is divisible into five fairly well defined groups typified by the following characteristic species:

¹See Pilsbry, *Man. Conch.* 2nd Ser., Vol. XI, p. 125.

- Group of *B. sufflatus*
 " " *B. montezuma*
 " " *B. artemesia (Plicolumna)*
 " " *B. inscendens*
 " " *B. spirifer (Sonorina)*

Group of *B. sufflatus*

The species of this group are known by their globose shape and non-reflected peristome. Through *B. levis* they show intergradation with the forms having a more elevated and acutely conical spire.

The following list shows the number of names which have been given in the group. Those in italics are believed to be synonyms or unrecognizable.

<i>B. vesicalis</i> (Gould)	<i>B. pilula</i> (Binney)
<i>B. sufflatus</i> (Gould)	<i>B. cooperi</i> Dall
<i>B. juarezi</i> (Pfeiffer)	<i>B. decipiens</i> Cooper
<i>B. insularis</i> (Cooper)	<i>B. levis</i> Dall
<i>B. chinchensis</i> Cooper	
<i>B. recognitus</i> Mabilie	

The species are confined chiefly to the lower Cape Region. Pilsbry, in 1897-98² monographed the group as then known and no additional names appear to have been added since. The only changes which are suggested through the present study are as follows:

The names *insularis* and *chinchensis* were given by Cooper,³ to supposed subspecies of *sufflatus*. The differentiating characters, however, if present are not well described. It is not believed that sufficient well labelled material has accumulated for a racial study of the group and both above names would better be dropped. The original specimens of *insularis* came from Espiritu Santo Island and may represent a distinct species but this has not as yet been shown. The 1921 Expedition failed to find it there. A single immature individual was taken on Ceralbo Island, farther south, by Mr. I. M. Johnston but no characters are perceived to differentiate it from *sufflatus*. Of the latter the Academy collection contains two specimens from La Paz collected by Woodworth and three from Ensenada de

²Man. Conch. Vol. XI, 1897-98, pp. 135-141.

³Proc. Calif. Acad. Sci., 2nd Ser., Vol. III, 1893, p. 212, pl. 14, fig. 6; Vol. IV, p. 140, pl. 5, fig. 10.

la Palma in the Cape Region collected by Joseph R. Slevin in 1919.

Mabile's species, *recognitus*, cannot be recognized in spite of the name. It should probably be placed in the synonymy of *sufflatus*.

There is a possibility that *cooperi* and *decipiens* refer to the same species. Both names were published in 1895, the latter having precedence of two months according to Pilsbry.⁴ *B. decipiens*, however, was described from immature individuals and one would have great difficulty recognizing the species from the description; it has not been figured.

B. pilula (Binney) was described from Todos Santos Mission in the Cape Region (west side) and Margarita Island which forms part of the outer boundary of Magdalena Bay. The latter locality is very probably erroneous.

Group of *B. montezuma*

To this group belong the very large bulimuli confined chiefly to the Cape Region. The names which have been given in the group are as follows,—synonyms and unrecognizable forms being in italics:

<i>B. montezuma</i> Dall	<i>B. acholus</i> Mabile
<i>B. proteus</i> (Broderip)	<i>B. cosmicus</i> Mabile
<i>B. excelsus</i> (Gould)	<i>B. baileyi</i> Dall
<i>B. sinaloa</i> Pilsbry	<i>B. gabbi</i> Cross & Fisher
<i>B. elatus</i> (Gould)	<i>B. slevini</i> , n. sp.
<i>B. pallidor</i> (Sowerby)	<i>B. santacruzensis</i> , n. sp.
<i>B. vegetus</i> (Gould)	<i>B. ceralboensis</i> , n. sp.
<i>B. vegexpizo</i> Cooper	<i>B. johnstoni</i> , n. sp.
<i>B. striatulus</i> Dall	

A monograph of the group was published in 1897-98 by Pilsbry⁵ and no additions or emendations seem to have been made until now. In the preparation of the following report the only modifications which appear necessary are as follows:

There is practically no basis for separating the species *excelsus* (Gould) and *pallidor* (Sowerby), when the descriptions and figures of Pilsbry are closely compared. It seems that the former name has been restricted to the long slender speci-

⁴Man. Conch. Vol. XI, p. 151 under *Plicolumna*.

⁵Man. Conch. 2nd Ser., Vol. XI, 1897-98, pp. 141-143.

mens of pale flesh color. A somewhat larger and more robust form was named subspecifically, *sinaloa* by Pilsbry, the specimens having come presumably from the State of Sinaloa, Mexico. Many individuals in the Academy collection from La Paz, San Jose del Cabo and Ensenada de la Palma, cannot be distinguished from the figures of *sinaloa*; the name is therefore considered of little systematic value. It is very doubtful if Gabb's specimens, upon which the subspecies was founded, actually came from Sinaloa; unless definite evidence can be produced to show that this is true, the writer would be inclined to discredit the record because of the loose manner in which he kept his locality records on his 1867 trip.

White specimens with the last whorl more horizontally expanded have been referred to *pallidor* but there is every gradation between the two forms in the Academy's series from the peninsula.

But the dark brown form with open umbilicus, granular surface due to spiral striations, low spire, and slightly expanded peristome, named *striatulus* by Dall^a appears to be a decidedly distinct species. It has been listed from Carmen and Margarita islands. The Academy has large numbers of specimens from the latter place but it was not found on Carmen Island by the 1921 Expedition and it is very doubtful if it occurs there; the members of the party covered the territory well and collected almost 400 specimens of another species of *Bulinulus* but not one of the *montezuma* group.

Mabille's species, as usual, are entirely unrecognizable.

B. baileyi Dall has been credited to Cape San Lucas but it is very doubtful if it occurs there.

1. *Bulinulus santacruzensis* Hanna, new species

Plate 7, figures 12-15

Shell similar to *B. strevini* of Monserrate Island but larger on the average; peristome broader; columellar fold much more strongly developed but no indication of a plication on the axis; spiral sculpture absent; body wall with a callous deposit connecting the terminations of the peristome.

^aProc. U. S. Nat. Mus., Vol. 16, 1893, p. 640, pl. 72, fig. 3.

Type: No. 1030; paratypes, Nos. 1031-1033; Mus. Calif. Acad. Sci., collected by members of 1921 Expedition on **Santa Cruz Island, Gulf of California**, May 27, 1921. The type lot consists of 31 specimens, collected by Fred Baker, J. C. Chamberlin, I. M. Johnston, V. Owen, J. R. Slevin and E. P. Van Duzee.

Measurements in millimeters

Altitude	Diameter	Altitude of aperture
38.	20.6	20.1 (Type)
41.2	20.	21.9
37.8	20.	18.9
33.3	17.	17.
31.7	17.3	15.7
34.	18.3	16.5
36.5	18.6	18.
39.4	21.5	20.8
40.1	22.6	20.5

This species varies in size to an excessive degree and some large individuals approach *B. pallidor* (or *excelsus*) from La Paz. But the proportions differ; the smallest individual of the latter among a large number in the Academy collection measures: altitude, 35.5 mm.; diameter, 21.5 mm.; altitude of aperture, 20.6 mm. But the chief difference is in the reflected peristome; in *santacruzensis* it is broadly revolute on the outer wall, while in the *pallidor-excelsus* group it is merely thickened on the inside and slightly expanded in this region. Undoubtedly *B. slevini* is a closely related form but in the large series of both, there appears to be a tendency toward intergradation in only two or three individuals.

2. *Bulimulus slevini* Hanna, new species

Plate 7, figures 16-19

Shell short but robust, composed of about $6\frac{1}{2}$ whorls, slightly rounded and with suture impressed lightly; spire with upper four whorls regularly conical but below this it becomes convex due to unequal rate of growth during later stages; color brownish flesh-color when alive, aperture not differing from remainder of shell; surface very slightly glossy when alive, roughened by growth lines which are usually more regu-

lar than in other species of the group; spiral sculpture absent in type, when present, exceedingly faint; nucleus composed of two costulate whorls; aperture rounded, with an indistinct fold on the columella but no spiral lamina as in *Sonorina*; peristome reflected and revolute as though rolled back, umbilicus rimate.

Type: No. 1034; paratypes, Nos. 1035-1038; Mus. Calif. Acad. Sci., collected by members of 1921 Expedition on **Monserrate Island, Gulf of California**, May 24, 1921. The type lot consists of 51 specimens collected by Joseph R. Slevin, E. P. Van Duzee, J. C. Chamberlin, V. Owen and I. M. Johnston.

Measurements in millimeters

Altitude	Diameter	Altitude of aperture
33.7	16.5	17.1 (Type)
31.2	16.5	17.1
34.6	17.1	16.8
35.	16.	17.8
29.5	14.4	14.6
29.2	15.5	15.8
30.6	17.1	16.9

This species does not show as wide a range of variation in size as some others. It is related closely to *santacruzensis* and *ceralboensis* but differs as pointed out under those forms. In a thorough biologic study intergradation of the three might be demonstrated and then the latter would become subspecies; but the material is not now available to show this in every character. *B. johnstoni* is also related to this but is constantly smaller. All four differ from the other members of the *montezuma* group in the submergence of spiral sculpture; nevertheless, they appear to belong therein rather than to any other which has been defined. The complete absence of denticle or plait on the axis removes them definitely from *Sonorina*. *B. gabbi* Cross & Fisher, is similar in size to *B. slevini* but the very characteristic spiral rows of beads or minute tubercles make confusion therewith unlikely.

Named for Joseph R. Slevin, who was in charge of the Expedition.

3. *Bulimulus ceralboensis* Hanna, new species

Plate 7, figure 11; plate 11, figures 2, 4

Shell of medium size, similar in shape to the slender form usually referred to *B. excelsus* in accordance with Gould's type specimen, but that species is much larger; peristome thickened within and expanded on the outer wall slightly; not revolute as in the species from Santa Catalina, Santa Cruz and Monserrate islands farther north; columellar fold not developed in the slightest degree; apex blunt; nucleus costulate but not sharply defined from remainder of shell; transition into lower whorls gradual; spiral striation scarcely visible on weathered specimens (as the type) but fine and regular on live shells; this striation extends entirely to the apex and on the nuclear whorls is very delicate and regular producing a shagreen effect; the costæ of the first whorl of the nucleus are broken up making a series of pits as though it had been sculptured with a ball pein hammer; this condition has not been noted on any other species, although in *gabbi* and *excelsus* the apical costæ become wavy instead of straight.

Type: No. 1021; Mus. Calif. Acad. Sci., collected by Joseph C. Chamberlin west of Ruffo's ranch house, **Ceralbo Island, Gulf of California**, June 7, 1921. Paratype, No. 1022, collected at El Mostrador, same island, by Mr. Chamberlin. Two other specimens were collected on the same island.

Measurements in millimeters

Altitude	Diameter	Altitude of aperture
36.4	19.4	17.4 (Type)
36.2	19.2	17.3
36.8	19.7	19.

This species is undoubtedly related closely to the *excelsus-pallidor* complex although it is smaller than usual in that group; the shape and expansion of aperture show the relationship; but the absence of columellar fold and the characters of the nucleus distinguish it readily from any species known to the writer.

4. *Bulimulus johnstoni* Hanna, new species

Plate 7, figures 1-6; plate 11, figure 3

Shell small, light flesh color, darker on the apex; composed of almost six rounded whorls; nucleus heavily costulate, the costæ widely separated; interspaces flat and spirally striated but the striæ of unequal strength; nuclear whorls two, sharply separated from remainder of shell; body whorls roughened by heavy, unequal growth ridges and these crossed by numerous fine spirals; thus the shell is not glossy; peristome broadly reflected all around and deeply revolute, the terminations connected across the body whorl by a heavy callous deposit; columella with an indistinct fold but no trace of a plication or denticle as in the *Sonorina* group.

Type: No. 1024; paratypes, Nos. 1025-1029; Mus. Calif. Acad. Sci., collected on **Santa Catalina Island, Gulf of California**, by members of the 1921 Expedition. The type lot consists of about 2000 specimens taken by I. M. Johnston, E. P. Van Duzee, Virgil Owen, J. R. Slevin, J. C. Chamberlin and Fred Baker.

Measurements in millimeters

Altitude	Diameter	Altitude of aperture
29.1	15.3	16.6 (Type)
29.1	16.2	16.
28.1	13.8	14.8
31.5	16.1	16.
27.5	15.6	16.
25.3	14.3	14.3

This species is very evidently a dwarfed member of the *montezuma* group. It is so distinct from others that comparison is hardly necessary.

Section *Sonorina* Pilsbry

Sonorina PILSBRY, Nautilus Vol. 9, 1896, p. 114; type *B. spirifer* Gabb.
PILSBRY, Man. Conch., 2nd Ser. Vol. XI, 1897-8, p. 155.

The name *Sonorina* was used to replace *Leptobyrus* Cross & Fisher⁷ because that name was preoccupied by *Leptobyrus* Stål in Entomology. The group is characterized by the pres-

⁷Moll. Terr. et Fluv. Mex. I, 1874, p. 475.

ence of a tooth on the axis of the shell, usually only partially or not at all visible from the aperture.

All of the species are confined to Lower California and the adjacent islands of the Gulf. The following is a complete list, synonyms or unidentifiable species being in italics:

<i>B. spirifer</i> (Gabb)	<i>B. lapidivagus</i> (Mabille)
<i>B. rimatus</i> (Pfeiffer)	<i>B. subspirifer</i> (Mabille)
<i>B. bryanti</i> Cooper	<i>B. dismenicus</i> (Mabille)
<i>B. orthelasmus</i> (Pilsbry)	<i>B. ximenez</i> , n. sp.
<i>B. lamellifer</i> (Pilsbry)	<i>B. bakeri</i> , n. sp.
<i>B. veseyianus</i> Dall	<i>B. chamberlini</i> , n. sp.
<i>B. dentifer</i> (Mabille)	

5. *Bulimulus dentifer* Mabille

Plate 8, figures 16-20

Bulimulus (Leptobyrus) dentifer MABILLE, Bull. Soc. Philomath. (8)
Vol. VII, p. 67, 1895.—PILSBRY, Man. Conch., Vol. XI, p. 161, 1897-8.

The Academy Expedition found this species exceedingly abundant everywhere on Tortuga Island, near the center of the Gulf of California from where it was originally described. It was particularly common inside the crater of the extinct volcano which forms the center of the island. Nearly a thousand specimens were collected, many of them alive. The original description (quoted by Pilsbry) mentions microscopical spiral striæ as though they were present over the entire shell, but they are visible only on the uppermost two or three whorls (exclusive of the nucleus) and rarely there. The nucleus is composed of one and a half to one and three-fourths whorls, marked by sharp, evenly spaced, vertical riblets. The axial denticle is partially visible from the aperture and is a high, lamellar plait, the outer margin being sinuous. Living shells are uniform brown with the expanded outer lip having a slight purplish tint. Variation in size is excessive as shown by the following table, yet the largest specimen is smaller than any other species of the region except *B. chamberlini*.

Measurements in millimeters^a

Altitude	Diameter	Altitude of aperture
23.7	12.8	11.5
23.4	11.8	11.3
23.	11.	10.8
22.5	9.8	10.
19.2	9.6	9.2

The genitalia are of the general form of *B. pallidor* Sowerby^b as figured by Pilsbry. The elements are long and slender, the short retractor muscle being attached to the tip of the penis. It is attached to the body wall near the upper end of the mantle cavity. The vas deferens is attached to the base of the penis and is a very slender, unconvoluted duct.

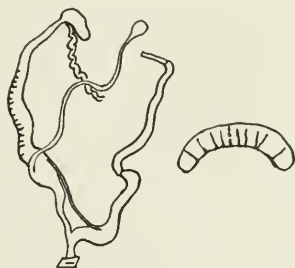


Fig. 1. Genitalia and jaw of *Bulimulus dentifer* Mabile

The spermatheca is globular and on a duct fully as long as the oviduct. The jaw is composed of about 12 heavy, flat, irregular plaits; radula with 30-1-30 rows of teeth. The main blood vessel of the mantle has branches on each side about equal in number and size.

The original description, like others of Mabile's, is entirely unrecognizable; he did not furnish illustrations and failed to make comparison with any known form. Under ordinary circumstances it would be necessary to discard his name completely, an unavoidable course which must be adopted with his

^aThe specimens measured are the plesiotypes figured herein and were selected from the lot of about 1000 shells; they show approximately the maximum range of variation.

^bPilsbry, Man. Conch., Vol. XIV, pl. 52, fig. 28.

other Lower California bulimuli; but in this case there is almost certain assurance that we are dealing with the same species Mabile had. Tortuga Island is small and it is improbable that two species of *Bulimulus* inhabit it. As a general thing it would seem unwise to refer specimens to unrecognizable species unless, as in this case, certain limitations, geographic or otherwise, enable them to be fixed with reasonable certainty. Pilsbry's forceful comments upon Mabile's "diletante trash" are well worth consulting in this connection.¹⁰

6. *Bulimulus chamberlini* Hanna, new species

Plate 8, figure 21

Shell very small; whorls flattened with suture lightly impressed; pale flesh color, marked only with fine thread like lines of growth; no spiral sculpture visible on type specimen under moderate magnification; umbilicus rimate; aperture ovate; peristome expanded on all sides but not revolute; the terminations approaching and connected across by a thin wash of callus; axis armed internally with a roundly triangular tooth in the usual position of the denticle in the group *Sonorina*. Altitude of imperfect type, 15.8 mm.; original altitude about 20 mm.; diameter, 9.2 mm.; altitude of aperture, 9.2 mm.

Type: No. 1023; Mus. Calif. Acad. Sci., collected May 27, 1921, by Joseph C. Chamberlin, on San Diego Island, Gulf of California.

This species is more closely related to *B. dentifer* than any other. It is still smaller than the smallest examples of that species; the outer termination of the peristome is more nearly vertically above the columellar termination; the peristome is not revolute; and the axial tooth is shaped as in *B. veseyianus* as figured by Pilsbry¹¹ while in *dentifer* it is square and sinuous on the outer edge similar to *lamellifer*.

Usually it is unsafe to describe a species from one imperfect specimen but in this case the essential characters are all well preserved and so distinct from any known form that the action seems justified.

¹⁰*Nautilus*, Vol. IX, 1895, p. 83.

¹¹*Man. Conch.*, Vol. XI, pl. 21, fig. 93.

The species is named for Mr. Joseph C. Chamberlin of the 1921 Expedition, who collected the type specimen.

7. *Bulimulus rimatus* (Pfeiffer)

Bulimulus rimatus (PFEIFFER), PILSBRY, Man. Conch., Vol. XI, 1897-98, p. 157, pl. 21, figs. 1-4.

Bulimulus bryanti COOPER, Proc. Calif. Acad. Sci., 2nd Ser., Vol. 3, 1893, pp. 101, 340, pl. 13, figs. 4 a-c.

This species was not collected by the members of the 1921 Expedition because they did not visit its habitat in the Cape Region. But Joseph R. Slevin collected two excellent specimens alive (No. 18,366, C.A.S. Coll.) at Rancho Guamuchil, near Todos Santos (Cape Region) August 7, 1919. They were found at an elevation of 1000 feet in cracks between boulders beside a creek bed.

Pilsbry has placed the species described by Cooper as *bryanti* in the synonymy of *rimatus* and a careful reading of the original descriptions has convinced me that this action was justified.

8. *Bulimulus lamellifer* Pilsbry

Bulimulus lamellifer PILSBRY, Nautilus, Vol. 10, 1897, p. 103.—PILSBRY, Manual Conch., Vol. XI, 2nd Ser., 1897-8, p. 160, pl. 21, figs. 94-99.

The type locality of this species is given as "Lower California, probably on the Gulf side between San Antonio and San Borja."

Numerous specimens were obtained by the Academy Expedition from the following localities: Coyote Bay, Concepcion Bay, No. 22862, E. P. Van Duzee, Coll., 7 specimens; back of Agua Verde Bay, No. 22844, I. M. Johnston, Coll., 12 specimens; and Canyon west of Puerto Escondido, No. 22961, Joseph Chamberlin and I. M. Johnston, Colls., 40 specimens; Danzante Island, No. 22843, Fred Baker, Coll., 47 specimens.

The species belongs to the group, *Sonorina* Pilsbry, and is characterized chiefly by a "very high, thin, square or emarginate, erect plate", on the columella; this is similar to *B. dentifer* of Tortuga Island, but that is a much smaller form of the same group. The peristome of *lamellifer* is broadly reflected and there is considerable variation in size in a large

series of shells. Measurements of 24 specimens selected at random are as follows in millimeters:

Measurements in millimeters			
Cat. No.	Altitude	Diameter	Altitude of aperture
22961	33.5	14.9	15.3
	32.4	14.	14.5
	33.	16.5	15.5
	34.7	16.	16.4
	30.3	15.2	15.1
22862	31.4	15.3	15.8
	28.3	14.7	13.9
	28.3	14.9	14.3
	30.5	14.9	14.
22844	28.	13.5	13.2
	30.	13.2	13.9
	28.6	12.3	13.3
	28.5	13.	13.1
	27.6	14.2	13.5
22843	32.6	17.	15.9
	31.1	16.3	15.9
	32.1	16.8	16.4
	32.3	15.5	15.5
	33.2	16.5	16.9
	26.8	14.3	14.3
	27.6	14.	14.5
	31.	15.8	15.
	30.	15.7	15.5
	29.5	15.	15.

It will be noted from the foregoing that the series from Escondido Bay averages largest and that from Agua Verde Bay smallest. But the intergradation demonstrates that we are dealing with but one species in so far as these characters are concerned. The series from Danzante Island has a slightly longer aperture than the others when an average is taken but the difference is so slight and the intergradation so perfect that separation seems unwarranted.

When alive and fresh the shells are of a light, flesh-brown color and possess an "oily-gloss" on the surface; this is lost in weathered specimens to a large extent. The faint spiral striation mentioned by Pilsbry is evident on fresh shells but is lost to a considerable degree after they have become chalky.

The species resembles *B. spirifer* (Gabb) in shape, sculpture, and glossiness, but the peristome of that form is not so broadly reflected and revolute; moreover, the internal plait is a "corkscrew" thread on the axis in *spirifer* not a high, square denticle as in *lamellifer* and *dentifer*.

The very indefinite type locality of *lamellifer* is confusing. It is doubtful if it came from anywhere near San Borje back of Los Angeles Bay or San Antonio in the Cape Region. Gabb traversed the length of the Peninsula and it seems almost certain that he secured this species somewhere near the center. All three of the Academy localities are about midway between the two above mentioned, and since the party failed to find *B. spirifer* it seems almost equally certain that it is to be found only in the Cape Region, perhaps as far north as La Paz. The localities, near San Borja, San Jose on the Gulf and Tres Virgines near Santa Rosalia given by Pilsbry are questionable.

9. *Bulimulus ximenez* Hanna, new species

Plate 8, figures 4-9

Shell heavy, robust, whorls $6\frac{1}{4}$ to 7, light vinaceous flesh-color when alive; outer wall dark brown inside of aperture; growth lines rough and irregular; surface slightly glossy when alive, chalky white if long dead; peristome strongly reflected and revolute, the upper terminations approximating and connected across the body whorl by a heavy callus; whorls rounded and last one expanded greatly in its lower portion as the aperture is approached; back one-third whorl from the aperture, the axis is armed with a vertical plait or denticle; this is square in shape, slightly emarginate or sinuous on its outer edge; sometimes a considerable portion is visible from the aperture but more often only a columellar fold can be seen without breaking the shell behind; nucleus composed of two costulate whorls; spiral striation almost invisible on the type but in other specimens of the same lot it is seen to be present but very fine and regular.

Type: No. 1042; paratypes, Nos. 1043-1047; Mus. Calif. Acad. Sci., collected at **Marquer Bay, Carmen Island, Gulf of California**, by Fred Baker, J. C. Chamberlin, V. Owen, J. R.

Slevin and E. P. Van Duzee. The type lot, No. 22,965, consists of 163 specimens.

Measurements in millimeters

Altitude	Diameter	Altitude of aperture
34.3	18.2	19.
38.	18.2	19.9
41.	20.	19.7
34.	17.7	19.5
32.8	16.2	16.
30.7	16.6	17.
31.2	15.	15.5
33.7	17.	17.
37.8	20.7	21.2
36.	18.5	19.
32.4	18.3	18.4
33.1	19.	18.6
32.1	18.3	18.
33.7	17.2	17.6
31.1	16.	16.7
28.8	15.6	15.8
30.	17.	17.

Specimens examined

Catalogue No.	Locality	Collector	Number of specimens
22855	Agua Grande, Carmen I.	Fred Baker	4
22860	Salt Works, Carmen I.	V. Owen	60
		J. C. Chamberlin	
22872	Coronados Island	J. C. Chamberlin	77
		J. R. Slevin	
		Fred Baker	
		I. M. Johnston	
22963	South side main canyon, Carmen Island	Fred Baker	65
22966	North side main canyon, Carmen Island	Fred Baker	6
22965	Marquer Bay, Carmen I.	Fred Baker	163
		J. C. Chamberlin	
		I. M. Johnston	
		Virgil Owen	
		J. R. Slevin	
22967	South canyon near Yellow Bluff, Carmen I.	E. P. Van Duzee	19
		Fred Baker	

This species belongs to the group, Sonorina; it has the heavy, broadly reflected, peristome of *B. veseyanus*, but not the triangular denticle of that species. It has the huge,

quadrate, emarginate denticle of *B. lamellifer* and *B. dentifer* but a much more expanded basal aperture than any of the species mentioned. The subspecies, *B. spirifer orthelasmus* Pilsbry¹² has not been figured and was described without definite locality. The specimen had a high straight denticle, not sinuous or emarginate as in *lamellifer* or corkscrew shaped as in *spirifer*. The costæ on the nepionic whorls are developed in the same manner as in the other species of the group but they are less strongly marked; except for their regularity they are no more evident than the growth ridges lower on the shell.

From the measurements it will be seen that the smallest specimens came from Coronados Island. Intergradation occurs, however, in these as well as other characters.

It seems rather remarkable that this species of Carmen and Coronados islands should be most closely related to the form found on Espiritu Santo Island and not to that of the adjacent mainland and Danzante Island close by.

The species is named for Fortun Ximenez, pilot and in command of the ship *Concepcion*, which, sailing under orders from Cortez, discovered Lower California at La Paz Bay in 1834.¹³

10. *Bulimulus veseyianus* Dall

Plate 8, figures 1-3

Bulimulus (Leptobysus) veseyianus DALL, Proc. U. S. Nat. Mus., Vol. 16, 1893, p. 645, pl. 71, figs. 4, 5. Type locality, Espiritu Santo Island, Gulf of California, Lyman Belding, coll.—PILSBRY, Man. Conch., 2nd Ser., Vol. XI, 1897-98, p. 160, pl. 21, figs. 92-93.

The Academy Expedition of 1921 collected three lots of this species on Espiritu Santo Island: No. 22841, first anchorage North Island, five specimens, Virgil Owen, coll.; No. 22842, El Candelero, 13 specimens, I. M. Johnston, coll.; No. 22839 north end section of island, 5 specimens, I. M. Johnston, coll.

The species was founded upon and has heretofore been known from the five original specimens collected by Belding

¹²Man. Conch. 2nd. Ser., Vol. XI, 1897-8, p. 159.

¹³The account may be found in Resources of the Pacific Slope, 1869, by J. Ross Browne, appendix p. 15. Ximenez had murdered his captain, Becarra, and was in turn killed with twenty of his crew by natives at La Paz. The following year the place was visited by Cortez, urged on by the beautiful pearls brought back by the crew of the *Concepcion*.

about 1883. The following measurements will aid further in making the species recognizable.

Measurements in millimeters

Altitude	Diameter	Altitude of aperture	Cat. No.
41.	21.	20.	} 22841
37.3	19.8	19.3	
37.6	20.3	21.	
36.5	20.4	19.9	} 22839
41.7	22.4	21.5	
38.8	18.	17.7	
40.2	20.	20.3	} 22842
40.6	20.9	21.4	
41.	21.2	21.2	

This species has a corkscrew like lamella on the axis as in *B. spirifer* but is larger than that form and has the greatly expanded aperture and reflexed peristome of *B. ximenez*. The lamella extends back three-fourths of a whorl and at its upper end it is projected outward into a linguiform denticle as shown herewith and in the original figure. The development of this denticle is somewhat dependent upon age, younger individuals having the lamella projected no more than in *B. spirifer*.

11. *Bulimulus bakeri* Hanna, new species

Plate 7, figures 7-10

Shell of medium size, slightly glossy, light flesh brown in color somewhat streaked with a lighter color parallel to growth lines; whorls almost 7 (in type) slightly rounded to the apex; nucleus composed of two costulate whorls as usual in the group; umbilicus rimate; aperture ovate with broadly expanded peristome all around; terminations closely approximated; peristome slightly revolute on outer margin; axis thickened and with two long low blunt denticles in the same position as the blade like lamella of *lamellifer*; just back of the aperture the sculpture consists of irregular growth lines crossed by regular, microscopic, incised lines; these become weaker toward the upper whorls of the shell.

Type: No. 1017; paratypes, Nos. 1018-1020; Mus. Calif. Acad. Sci., collected in 1921 by Virgil Owen at San Antonio

Point, San Nicolas Bay, Lower California. The type lot consists of eight specimens.

Measurements in millimeters

Altitude	Diameter	Altitude of aperture
35.6	16.8	16. (Type)
32.8	15.	14.5
34.1	15.5	14.8
31.5	15.5	14.1
31.2	14.6	13.5

Named for Dr. Fred Baker, conchologist of the Expedition.

The species seems to be more closely related to *B. spirifer* in external characters than any other. But the greatly reduced size of the armature of the axis distinguishes it from any other form and gives it an intermediate position between the group of *B. inscendens* and *Sonorina*. The peristome is not so broadly reflected as in *B. lamellifer*, also a peninsular form.

In this connection attention is called to the fact that the members of the 1921 Expedition failed to find *B. spirifer* Gabb. In characteristic manner Gabb gave the locality of his species as, ".....the mountains, among rocks from San Antonio below La Paz to near San Borja and in the highest mountains perhaps even farther north."¹⁴

In 1867 he made a trip on horseback from Cape San Lucas to San Diego, crossing the peninsula ten times before completing the journey. Thus he visited most of the important settlements on both sides, as well as the interior missions. His itinerary is given fully with a great deal of other information on the geology and conditions encountered in "Resources of the Pacific Slope" by J. Ross Browne, D. Appleton & Co., New York, 1869. In this he did not mention *Bulimulus* collections so it is probably impossible ever to determine the type locality of his *spirifer* exactly, but it quite evidently does not come down to the east coast regularly. On the other hand, it is equally doubtful if, in the mountains, it occupies anything like the extensive range the author gave it. The San Antonio mines and San Borje are about 600 miles apart.

¹⁴Amer. Journal Conch., Vol. III, p. 236, pl. 16, fig. 5, 1867.

Section *Plicolumna* Cooper

The three species of this group are confined to the Cape Region and hence were not encountered by the 1921 Expedition. They are *artemesia*, *abbreviatus* and *ramentosus*, and are well described and figured by Pilsbry.¹⁵

Group of *B. inscendens*

In order to complete the review of the Lower California bulimuli the species of this group will be listed. Additions and emendations have not been made since the appearance of Pilsbry's monograph in 1897-98.¹⁶

The following list shows the names which have been referred to the group, synonyms or unrecognizable species being in italics:

<i>B. inscendens</i> (Binney)	<i>B. monticola</i> Dall
<i>B. xantusi</i> (Binney)	<i>B. cacotycus</i> Mabille
<i>B. beldingi</i> Cooper	<i>B. digucti</i> Mabille
<i>B. alta</i> Dall	

The subspecies *alta* and *monticola* are of doubtful taxonomic value; they appear to represent variations rather than biological units; only one of them can stand at best. The names of Mabille can only be validated by a re-examination of his material; otherwise they are worse than *nomen nuda*. Eliminating these leaves three valid species of the group, *inscendens*, *xantusi*, and *beldingi* with the possibility of *alta* being added to the list. All are confined to the Cape Region and hence were without the territory examined by the 1921 Expedition.

Genus *Micrarionta* Ancy, 1880

The type of this group of helicies is *Helix facta* of certain of the Santa Barbara Islands off the coast of California. It has been divided into three sections as follows: *Micrarionta* s. s.; *Eremarionta* Pilsbry; and *Xerarionta* Pilsbry. The second group consists of species of the desert regions of California, Arizona and Lower California and the shells greatly resemble those of the genus *Sonorella*. The species of the third group

¹⁵Man. Conch., 2nd Ser., Vol. XI, 1897-98, pp. 151-154.

¹⁶Man. Conch., 2nd Ser., Vol. XI., 1897-98, pp. 148-151.

are large and globose as a rule and are confined chiefly to the islands off the coast of California and Lower California, although a few have been taken on neighboring shores of the mainland and peninsula. In considering results of the 1921 Expedition it is necessary to treat only one species of each of the last two groups, the first not being found in the region covered.

12. *Micrarionta peninsularis* (Pilsbry)¹⁷

Plate 8, figures 14, 15; plate 11, figure 1

Sonorella peninsularis PILSBRY, Nautilus, Vol. 29, 1916, p. 100, pl. 2, fig. 4.

This species was described from specimens collected by Gabb in 1867 on his memorable journey overland from Cape San Lucas to San Diego. He gave the locality as "Trinidad on the west coast near San Borja." The mission San Borje is 18 miles west of the Gulf Coast at Angeles Bay. Pilsbry was unable to locate "Trinidad" on available maps and it is not given on the latest and most complete one I have seen, made by E. W. Nelson and published in 1921.¹⁸ The locality should not be confounded with the well known Trinidad Valley just to the north of the San Pedro Martir Mountains and opposite San Felipe Bay, 160 miles north of Angeles Bay. Nelson has given a description of that valley in his memoir.¹⁹

The location of Gabb's "Trinidad" is minutely described by him in the narrative of his journey, published in 1869.²⁰ It is a deep canyon with a spring, on the west side of the peninsular divide. The party camped at the spring while examining prospective copper properties within a day's journey of the place. It is about 20 miles ("7 leagues") south of Rosarito (see Nelson's map) which would be the arroyo now known as "San Luis." This heads in the Sierra de Calmalli. Thus the type locality of the species appears to be approximately 30 miles south of San Borje.

¹⁷The Helicis of Lower California are fully treated in the following publications: BARTSCH, Smith. Misc. Coll. Vol. 47, 1904, pp. 187-200—PILSBRY, Proc. Acad. Nat. Sci. Phila. 1913, pp. 380-393.—PILSBRY, Nautilus, 1916, Vol. 29, pp. 97-102.—BERRY, Proc. Acad. Nat. Sci. Phila. 1922, pp. 69-100.

¹⁸Mem. Nat. Acad. Sci., Vol. 16.

¹⁹Op. Cit. pp. 16, 18, 19, 76.

²⁰J. Ross Browne, Resources of the Pacific Slope, 1869, pp. 105-107 of Appendix. D. Appleton & Co., New York. A second edition seems to have been issued in 1887 but I have not seen it.

A "Trinidad Point" is indicated on some maps just south of San Carlos Bay on the Gulf Coast of the peninsula but has nothing to do with Gabb's locality.

Micrarionta merrilli (Bartsch)²¹ was described with the type locality given indefinitely as "Below San Quintin, Lower California." I have made no attempt in this connection to trace the locality further because the species is obviously distinct from the one with which we are dealing.

Mr. Johnston of the 1921 Expedition took two weathered shells of what appears to be *M. peninsularis* two miles back of Angeles Bay. It is not known if they were in a position which would indicate that they had been washed from the mountains farther west but the sand inside the apertures shows conclusively that they had been carried by water for some distance. It seems probable that the species occupies the region of the divide west of Angeles Bay, and empty shells might float toward either coast when streams are swollen.

The largest and best preserved specimen is 19.6 mm. in diameter; 13 mm. in altitude and the umbilicus is 2.3 mm. in diameter. In shape it agrees almost exactly with Pilsbry's figures. The apex is figured herewith. The wavy rugosity seems to extend farther down on the nuclear whorls than the author of the species described, but this is not certain. The nuclear characters seem to show a closer relationship with *M. fisheri* (Bartsch) from Death Valley, California, than with such as *M. orcutti* (Bartsch) from Mountain Springs, San Diego County, California.

All of the Sonorella-like helicies from west of the Arizona-California boundary have been found to belong to the genus *Micrarionta* when the anatomy has been investigated. It therefore seems reasonable to infer that the same is true of them all.²²

A fragment of another species of the same section of the genus was obtained at Puerto Refugio, Angel de la Guarda Island, by the 1921 Expedition. It is smaller than *M. peninsularis* and has a much wider umbilicus but is too imperfectly represented for specific description.

²¹*Sonorella merrilli* BARTSCH, Smith, Misc. Coll., Vol. 47, 1904, p. 192, pl. 32, fig. 5.

²²See Berry, Proc. Acad. Nat. Sci. Phila. 1922, p. 86, for a discussion of this subject.

13. *Micrarionta exanimata* (Cooper)

Plate 8, figures 11-13

H. (elix) areolata var. *exanimata* COOPER, Proc. Calif. Acad. Sci., 2nd Ser., Vol. 3, July 15, 1893, p. 216, pl. 14, fig. 7.

(*Micrarionta areolata*) var. *exanimata* (COOPER), PILSBRY, Proc. Acad. Nat. Sci. Phila. 1913, p. 393.

This form was described from 38 subfossil specimens collected on Espiritu Santo Island by Mr. W. E. Bryant of the California Academy of Sciences in 1892 but was not found there by the members of the 1921 Expedition. On Monserrate Island, however, Mr. E. P. Van Duzee collected seven specimens which agree sufficiently with Cooper's description to be referred thereto. The description is so poor it is scarcely recognizable, and the figures are worse, but both lots of material were subfossil and are believed to be the remains of a now extinct species which formerly inhabited a larger land mass than now exists off shore in the region. The Monserrate Island specimens are certainly specifically distinct from *M. areolata* as that species is found about Magdalena Bay on the west coast of the peninsula. They are much more nearly like the form of *M. levis* with the heavy columellar tooth found on Natividad Island specimens. No trace of a former system of bands could be detected in the Monserrate specimens.

14. *Thysanophora hornii* (Gabb)

Single specimens of what appear to be this species were collected by the members of the 1921 Expedition at three places in the Gulf of California region: Agua Verde Bay, L. C.; Carmen Island; and Monserrate Island. The one from the first mentioned place is the largest, being 3.5 mm. in diameter; it has 3.75 whorls and the last two are hirsute. The specimen from Monserrate Island is young, glassy transparent instead of brown and may belong to a different species, but in shape and size it corresponds to an equivalent portion of the largest specimen.

15. *Berendtia taylori* (Pfeiffer)

Plate 8, figure 10

Clausilia (*Balca*?) *taylori* PFEIFFER, Proc. Zool. Soc. London, 1861, p. 27, pl. 2, fig. 7.—CROSS & FISHER, Miss. Scient. au Mex., Moll., Vol. 1, p. 304, pl. 14, fig. 1, pl. 16, figs. 1-4 (Shell and anatomy).

Berendtia taylori, PILSBRY, Man. Conch., Vol. 15, 1903, 2nd Ser., pp. 57-58, pl. 18, figs. 30-36.

Cylindrella (*Urocoptis*) *newcombiana* GABB, Amer. Journ. Conch., Vol. 3, 1867, p. 237, pl. 16, fig. 3.

While working in a canyon back of Puerto Escondido, Lower California, Messrs. I. M. Johnston and J. C. Chamberlin came across this strange species and collected 46 specimens. The locality from which the original specimen came was unknown and to this date the species has been known chiefly through specimens collected in the mountains west of Mulegé by Gabb in 1867 and which he described as a new species.

Genus *Cælocentrum* Cross & Fisher

The type species of this genus is *C. turris* Pfeiffer²³ of southeastern Mexico. Most of the species live in Mexico or Central America but a group, somewhat aberrant, is found in Lower California; this has received the subgeneric name *Spartocentrum*,²⁴ with *C. irregulare* Gabb as type. Mabille²⁵ also gave the group a name, *Teneritia* with the unrecognizable species, *Berendtia digueti* and *B. minorina* as types.

The name *Spartocentrum* will probably eventually be given generic rank. Up to the date of this report five species have been described from the region. The members of the 1921 Academy Expedition obtained many hundreds of specimens at various localities and in identifying them it has been necessary to review those previously known. The complete list is as follows; synonyms or unrecognizable forms being in italics:

<i>C. irregulare</i> (Gabb)	<i>C. digueti</i> (Mabille)
<i>C. gabbi</i> Pilsbry	<i>C. minorinum</i> (Mabille)
<i>C. eisenianum</i> Pilsbry	<i>C. eiseni</i> Bartsch

²³Pilsbry, Man. Conch., 2nd Ser., Vol. XV, 1903, p. 37, pl. 12, figs. 1-4.

²⁴Dall, Nautilus, Vol. IX, 1895, p. 51.

²⁵Bull. de la Soc. Philomathique de Paris, 8th Ser. Vol. IX, 1896-97, p. 79.

The first species was collected by Gabb in 1867 in the mountains back of Mulegé near the east coast of the peninsula half-way down. He described it soon after his return.²⁶ He must have collected a very considerable number of specimens because the original lot has been widely distributed. Some went to Dr. Wesley Newcomb, who, in turn, gave them to his friend Henry Hemphill. These now form part of the Academy Collection.

Mabille in 1896-97 described two new species in a slipshod manner, *digueti* and *minorina*, neither of which was figured or compared with other species. They are absolutely unrecognizable without access to his original collection.

A monograph of the group by Pilsbry appeared in 1903.²⁷ He described a new species *C. eisenianum* from Cape San Lucas.²⁸

Through lack of sufficient comparative material he described a new subspecies, *gabbi*, from Gabb's original material and attached it to *minorinum*. The separation from *irregulare* was based chiefly upon the shape and free extension of the aperture. The type of *irregulare* has the aperture appressed to the body whorl and thus becomes horizontal, or almost so, on top. But the type of *gabbi* has the aperture at the end of a free extension of the body whorl and is correspondingly changed in shape, due probably to the manner in which the shell is carried by the animal before growth is completed. With a very large amount of material before me with colonies kept separated, the extension of the aperture is found to be of no importance as a taxonomic character in this group. The photographs of a series of specimens from Carmen Island illustrate this fact. The other characters mentioned to differentiate *gabbi* from *irregulare* are of minor importance and are completely bridged in a series of specimens from one colony. The difference in number of ribs on the penultimate whorl is given as only four.

This leaves but two recognizable species in the group, *irregulare* and *eisenianum*. To these are added herein:

²⁶Amer. Journal Conch., Vol. III, 1868, p. 238, pl. 16, fig. 4 as *Cylindrella* (*Urocoptis*) *irregularis*.

²⁷Man. Conch., 2nd Ser., Vol. 15, 1903, pp. 51-57.

²⁸See Bartsch, Proc. U. S. Nat. Mus., Vol. 31, 1907, p. 119, for full type locality. The specific name is there misquoted "C. eiseni." Pilsbry gave only "Lower California" as a locality in the original description.

C. vanduzeei
C. oweni

C. clavigeroi
C. insulare

16. *Cælocentrum irregulare* (Gabb)

Plate 9, figures 1, 2

Cylindrella (Urocoptis) irregularis GABB, Amer. Journ. Conch., Vol. 111, p. 238, pl. 16, fig. 4, 1868.—PILSBRY, Proc. Acad. Nat. Sci. Phila. 1900, pp. 553, 554, figs. 3, 4.

Cælocentrum irregulare, PILSBRY, Man. Conch., 2nd Ser., Vol. XV, 1903, p. 51, pl. 13, figs. 15, 16; pl. 17, fig. 24.

Cælocentrum minorinum gabbi PILSBRY, Proc. Acad. Nat. Sci. Phila. 1900, p. 551.—PILSBRY, Man. Conch., 2nd Ser., Vol. XV, 1903, p. 54, pl. 13, figs. 17-19.

This species was originally described from collections made by Gabb in 1867 in the "high mountains back of Mulegé", Lower California. It was not found by the members of the 1921 Expedition but the Academy is fortunate in possessing two specimens from the original collection which are figured herewith.

The species is imperforate; the axis is narrow and shaped like a round bar which has been twisted slightly off center.

17. *Cælocentrum vanduzeei* Hanna, new species

Plate 9, figures 31-34; plate 11, figure 7

Shell larger than *C. irregulare*, bullet-shaped, composed of 17 rounded whorls; suture deeply impressed; first three whorls of almost equal diameter, the third being slightly less than the one above; from the third to the fourteenth the diameter increases slightly, then decreases to the last; all whorls sculptured with coarse ribbing except the third; this one only has the vertical ribs cut by about nine deep spiral grooves, making the surface beaded; penultimate whorl with 86 ribs; aperture straight above, slightly oblique, and expanded; peristome continuous and sharp; columellar wall with a rounded ridge bounded by a rounded groove in lower basal angle; last 3.2 mm. of last whorl free from one preceding; umbilicus perforate, the opening about .5 mm. in diameter; axis hollow throughout, the opening in center of shell being two mm. in diameter; a heavy spiral cord is centrally located on the axis of

each whorl; below and above are concave excavations; this cord forms an external rounded ridge bounding the umbilical depression.

Type: No. 1085; paratypes, Nos. 1086-1088; Mus. Calif. Acad. Sci., collected by Edward P. Van Duzee June 14, 1921, on the west side of **Puerto Escondido, Lower California**.

Measurements in millimeters

Altitude	Diameter of penultimate whorl	Greatest diameter exclusive of projecting aperture.
24.9	5.5	5.6 (Type)
24.8	5.7	5.9 (Paratype)
24.4	5.6	5.6 (Paratype)

The species is distinct from *C. irregulare* by its slightly greater length, and decidedly greater diameter, both of shell and axis. Moreover, the internal spiral cord is very much heavier than in *C. irregulare*. In fact no close relative of the new species has been seen. The above is a description of the type specimen.

The series collected shows very little range in size but in shape of aperture it is great as shown in the figured paratypes. These offer conclusive proof that the projection of the free portion of the aperture is a character of individual variation only. If it were considered of specific value it would be necessary to describe every specimen in the lot as new. The shape of the aperture varies in accordance with the length of the free portion.

Named for Mr. Edward P. Van Duzee, curator of Entomology in the museum of the California Academy of Sciences, and a member of the Expedition.

18. **Cælocentrum insulare** Hanna, new species

Plate 9, figures 9-28; plate 11, figure 5

Shell, similar in shape to *C. oweni* but much more variable; type a shell of average size and shape, a little more slender than the above mentioned species; umbilicus of about the same diameter, but axis narrower and spiral cord less developed and less rounded in cross section; whorls $14\frac{1}{2}$ in type but only $11\frac{1}{2}$

in a paratype; all intergradations between are found in the type lot; last half of second whorl and all of third with the ribs crossed by heavy spiral channels; below this area the interspaces for three whorls are crossed by about five spiral riblets; the first and second whorls are densely, minutely, spirally striate in the intercostal spaces; this is a character more or less developed in *C. oweni* but is more pronounced in *C. insulare*; it is best displayed in weathered specimens.

Type: No. 1061; paratypes, Nos. 1062-1081; Mus. Calif. Acad. Sci., collected May 21, 1921, by Fred Baker and Virgil Owen at **Puerto Bellandra, Carmen Island, Gulf of California**. The type lot consists of over 500 specimens.

Measurements in millimeters

Altitude	Diameter exclusive of apertural projection	
16.6	3.8	(Type)
15.7	3.9	} Paratypes
17.6	3.7	
16.8	3.5	
14.5	3.5	
16.9	3.4	
13.5	3.8	
14.8	4.0	
13.4	4.0	

In contrast with *C. oweni* this species shows great individual variation as the above table of measurements portrays. In no case is the diameter as great as in *C. oweni*, therefore, there is no intergradation and the one is evidently not a subspecies of the other. The narrow axis is a constant character. Also the apical characters and the spiral intercostal riblets are likewise; these are best displayed on weathered shells. It may be suggested that the relative stability of the characters in *C. oweni* is due to the habitat being in proximity to greater moisture, while the Puerto Bellandra colonies are in an excessively dry and hot location.

In addition to the type lot 23 specimens collected by E. P. Van Duzee and J. C. Chamberlin at Marquer Bay, Carmen Island, have been referred to this species.

A careful examination failed to disclose any reasonably constant character whereby the specimens from Santa Catalina

Island could be separated from those from Puerto Bellandra, Carmen Island. With a large series of over 200 specimens, from the former place it is noted that the same great variation in number of whorls and altitude is displayed. Apical characters, sculpture and shape of axis are practically identical. The following are measurements of Santa Catalina Island specimens:

Measurements in millimeters	
Altitude	Diameter exclusive of projecting aperture
15.6	3.9
17.5	4.0
15.9	3.9
17.8	3.6
14.2	4.0
13.7	4.0

} Paratypes

A series of Santa Catalina specimens is figured herewith (pl. 9, figs. 18-24) to demonstrate their identity with those from Carmen Island.

The same remarks apply to a series of specimens taken by Mr. Chamberlin on Monserrate Island, and 66 specimens taken on Danzante Island by Dr. Baker and Mr. Johnston. No constant shell characters could be found to distinguish them from the type lot. Two from each island are figured herewith (pl. 9, figs. 25, 26 and 27, 28) to demonstrate the similarity.

It seems very remarkable that a species of this family, so prone to colonization, should have so wide a range among the Gulf islands. Such similarity was not displayed among the bulimuli.

19. *Cælocentrum oweni* Hanna, new species

Plate 9, figures 3-8; plate 11, figure 8

Shell small, short conical, composed of 14 rounded whorls; suture deeply impressed; all whorls coarsely sculptured with vertical ribs, the first half of the third whorl having in addition about 10 weak spiral channels crossing the ribs; the last three whorls almost equal in size but those above taper to the blunt apex with the first three again almost of equal diameter; penultimate whorl with 59 ribs; spaces between sometimes rounded,

again V-shaped and sometimes flatbottomed; (this however is true of all species of the group which have been studied); aperture almost circular, expanded, at the end of a free extension of the last whorl 2mm. long; parietal and columellar margins meeting at an obtuse angle inside, the latter with a faint trace of a plication at the base, the end of the axial cord; umbilicus .5 mm. in diameter; axis perforated to the apex; in the center of the shell the hole is no larger than the umbilicus; axis with a rounded spiral cord which slopes to the septum both above and below in straight lines until the latter is almost reached, when there is a concavity.

Type: No. 1055; paratypes, Nos. 1056-1060; Mus. Calif. Acad. Sci., collected by Virgil Owen June 15, 1921, in the canyon back of **Agua Grande, Carmen Island, Gulf of California**. The type lot consists of 86 specimens collected under a single stone.

Measurements in millimeters

Altitude	Diameter exclusive of apertural projection
17.2	4.3 (Type)
16.9	4.3 (Paratype)
16.2	4.2 "
17.3	4.2 "
17.1	4.2 "
16.5	4.4 "

The above description of external shell characters is derived from the type specimen, and internal characters from the figured paratype. In the type lot but little variation is found except in the distance of the free projecting portion of the last whorl. This is illustrated in the figures. *C. insulare* differs in the narrower axis and in apical characters.

Named for Mr. Virgil Owen, a member of the Expedition.

20. *Cælocentrum clavigeroi* Hanna, new species

Plate 9, figures 29, 30; plate 11, figure 6

Shell of medium size similar to *C. irregulare*; slender, consisting of 19 rounded whorls; first four and a half of approximately equal diameter; also the last six are about equal in

diameter, giving the shell a cylindrical appearance, as in *irregularis*; all whorls sculptured with axial ribs, those of the third whorl being crossed by 10 spiral channels producing a beaded sculpture; penultimate whorl with 60 axial ribs; umbilicus very narrowly perforate, the opening increasing in diameter toward the center of the axis; aperture angular, free from preceding whorl; no evidence of axial plication at basal angle; axis armed with a heavy square cord which in the lower whorls has a groove in the center.

Type: No. 1082; paratypes, Nos. 1083-1084; Mus. Calif. Acad. Sci., collected May 26, 1921, by I. M. Johnston at **Agua Verde Bay, Lower California**. The type lot consists of 12 specimens, mostly imperfect.

Measurements in millimeters

Altitude	Diameter exclusive of projecting aperture
25.3	4.5 (Type)
23.5	4.4

This species resembles *C. irregularis* externally. The perforate umbilicus and heavy, square axial cord distinguish it.

The species is named for Francisco Javier Clavigero, who published a valuable history of Lower California in Italian in 1789.

Genus *Pupoides* Pfeiffer

One of the most remarkable discoveries in land shell distribution made by the members of the 1921 Expedition was the finding of this genus on many of the Gulf of California islands. The affinities of the species are with Arizona forms and not with the one which has been found on the mainland of Mexico at Mazatlan, *P. chordatus*. This would indicate that the distribution is in some way connected with the currents from the Colorado River. But if so, why were not larger species similarly affected? Their course of migration has been directly opposite.

21. *Pupoides marginatus* (Say)

Cyclostoma marginata SAY, Journ. Acad. Nat. Sci. Phila., Vol. II, 1821, p. 172.—*Pupoides marginatus* (SAY), PILSBRY & VANATTA, Proc. Acad. Nat. Sci. Phila. 1900, p. 586.—PILSBRY, Man. Conch., 2nd Ser., Vol. 26, No. 102, p. 111, 1921; (full bibliography given and monograph of the genus).

This species was found in small numbers on several of the islands of the Gulf of California. The records are as follows:

Locality	Number of specimens
Angel de la Guarda Island	1
Tortuga Island	17
San Lorenzo Island	6
San Esteban Island	16
Monserrate Island	3

These specimens cannot be distinguished from the species as it occurs in Arizona. Regarding these, Pilsbry remarked: "In Arizona the shell is often small and delicate, length 4mm., hardly over 5 whorls, with scarcely any callous pad in the angle of the mouth, thus resembling *P. modicus*; but in the same lots there are also larger shells." The island specimens bear no resemblance to *P. chordatus*, described from Mazatlan, and they are likewise constantly distinguishable from the form found on Santa Catalina Island.

22. *Pupoides catalinensis* Hanna, new species

Plate 10, figures 1-4

Shell similar to *P. marginatus* but more slender and cylindrical; whorls five, rounded, suture deeply impressed; epidermis roughened parallel to growth lines, so the species is without gloss; growth lines fairly regular with an occasional white streak parallel to them; umbilicus rimate; peristome broadly reflected, thickened within and almost complete across the body whorl; no indentation of the aperture on the upper palatal wall.

Type: No. 1090; paratypes, Nos. 1091-1093; Mus. Calif. Acad. Sci., collected by J. C. Chamberlin on **Santa Catalina Island, Gulf of California**. The type lot consists of 82 specimens.

Measurements in millimeters

Altitude	Diameter
4.5	1.9 (Type)
4.3	1.7
4.0	1.5
3.8	1.6

This species has the shape of *P. hordaccus* (Gabb) but lacks the characteristic rib sculpture of that form. While the specimens of *Pupoides* from all of the other Gulf islands are clearly *marginatus* and agree with that species in size, shape and sculpture, this one on Santa Catalina Island is constantly different. There does not seem to be a tendency toward intergradation. There is some variation in altitude but the shape still remains more cylindrical than in *marginatus*.

23. *Gastrocopta pellucida parvidens* (Sterki)

Bif. (idaria) hordeacella PILS. var. *parvidens* STERKI, Nautilus, Vol. XII, 1899, p. 128.—PILSBRY & VANATTA, Proc. Acad. Nat. Sci. Phila. 1900, p. 594, pl. 22, fig. 2.—PILSBRY, Man. Conch., 2nd Ser., Vol. 24, p. 80, pl. 17, fig. 8.

This form was described from Jerome, Arizona, and has been found elsewhere in that state. It is characterized by a reduction in the size of the apertural teeth and the absence of a basal. Eight specimens were collected by the members of the 1921 Expedition on the volcanic island of Tortuga in the center of the Gulf of California. These are thin and delicate, very light horn-color or translucent white; they agree in every way with the figure given by Pilsbry except for a slightly greater development and bifurcation of the parietal tooth. This difference seems too small to recognize specifically since it is a more or less variable character in all species of the genus.

24. *Gastrocopta rixfordi* Hanna, new species

Plate 10, figures 5-8

Shell minute, cylindrical; whorls four, rounded; glassy transparent when alive; lines of growth very fine but evenly spaced; last whorl with an expanded bulge just back of the aperture; aperture semielliptical; peristome broadly reflected but not thickened with callus; ends continuous across the body whorl;

apertural armature consisting of five or six teeth depending upon the degree of separation of the parietal (type specimen has five); upper and lower palatal very deeply seated, flat and blade-like, the latter being the larger and deeper placed; basal thin, quadrangular, the axis placed parallel to the plane of the aperture, and the apex directly beneath the apex of the parietal; columellar long slender and high, the interior termination invisible from the aperture; parietal the heaviest of all, reaching nearly to the aperture; angulo-parietal spur united to the parietal in the type, bending outwardly toward the aperture and merging into the posterior peristome; (in the paratype figured and other specimens the angulo-parietal is separated from the parietal by a space). Altitude, 2.01 mm.; diameter, .81 mm.

Type: No. 1094; paratypes, Nos. 1095-1099; Mus. Calif. Acad. Sci., collected by Mr. J. C. Chamberlin May 25, 1921, on **Monserrate Island, Gulf of California**. The type lot consists of seven specimens.

In the occasional separation of the angulo-parietal tooth from the parietal, this species resembles the genus *Sterkia* where it is normally separated. Part of the type lots of each of the west American species of the genus, *calamitosa*, *clementina* and *hemphilli* are in the collection of the California Academy of Sciences and the possibility of their having originated from some such ancestral stock as *G. rixfordi* is suggested. On account of the color of the latter and the usual tooth arrangement (as in the type) the species is placed in the section *Albinula*. The shape of the whorl back of the aperture is strongly suggestive of the condition in *G. armifera* and *G. contracta*.

The species is named for Dr. Emmet Rixford of San Francisco, California.

25. *Planorbis tumens* Carpenter

Planorbis tumens CARPENTER, Cal. Mazatlan Shells, British Museum, 1857, p. 181.—BINNEY, Land and Freshwater Moll. of N. A., part 2, 1865, p. 106, fig. 180.—COOPER, Proc. Calif. Acad. Sci., 2nd Ser., Vol. 3, 1893, p. 217.

Mr. J. C. Chamberlin collected 25 specimens of a large *Planorbis* at Mulegé, Lower California. Cooper has recorded *P.*

tumens from San Jose del Cabo, and my reason for calling the Mulegé specimens the same is chiefly bibliographic. Until the genus is thoroughly monographed no large species from western North America can be identified with certainty, so involved has the literature become.

26. *Physa diaphana* Tryon

Physa diaphana TRYON, Am. Journ. Conch., Vol. 1, 1865, pp. 168, 224, pl. 23, fig. 11. Oakland, Calif.—COOPER, Zoc, Vol. 3, 1892, p. 20.

Specimens of *Physa* were obtained at a spring back of Angeles Bay (50 sp.); Mulegé, (12 sp.); and San Evaristo Bay, Espiritu Santo Island, (6 sp.). They are referred to *P. diaphana* with doubt but Cooper listed that species from San Jose del Cabo. West American species of the genus are in almost hopeless confusion so far as nomenclature is concerned and very few specimens can be identified positively.

PLATE VII

(All figures enlarged to 1.14 diameters.)

Fig. 1. *Bulimulus johnstoni*, new species; type No. 1024 (C.A.S. Type Coll.) from Santa Catalina Island, Gulf of California; p. 491.

Figs. 2-6. *Bulimulus johnstoni*, new species; paratypes Nos. 1025-1029 (C.A.S. Type Coll.) from Santa Catalina Island, Gulf of California; p. 491.

Fig. 7. *Bulimulus bakeri*, new species; type No. 1017 (C.A.S. Type Coll.) from San Antonio Point, Lower California (Gulf side); p. 500.

Figs. 8-10. *Bulimulus bakeri*, new species; paratypes Nos. 1018-1020 (C.A.S. Type Coll.) from San Antonio Point, Lower California (Gulf side); p. 500.

Fig. 11. *Bulimulus ceralboensis*, new species; type No. 1021 (C.A.S. Type Coll.) from Ceralbo Island, Gulf of California; p. 490.

Fig. 12. *Bulimulus santacruzensis*, new species; type No. 1030 (C.A.S. Type Coll.) from Santa Cruz Island, Gulf of California; p. 487.

Figs. 13-15. *Bulimulus santacruzensis*, new species; paratypes, Nos. 1031-1033 (C.A.S. Type Coll.) from Santa Cruz Island, Gulf of California; p. 487.

Fig. 16. *Bulimulus slevini*, new species; type No. 1034 (C.A.S. Type Coll.) from Monserrate Island, Gulf of California; p. 488.

Figs. 17-19. *Bulimulus slevini*, new species; paratypes Nos. 1035-1037 (C.A.S. Type Coll.) from Monserrate Island, Gulf of California; p. 488.

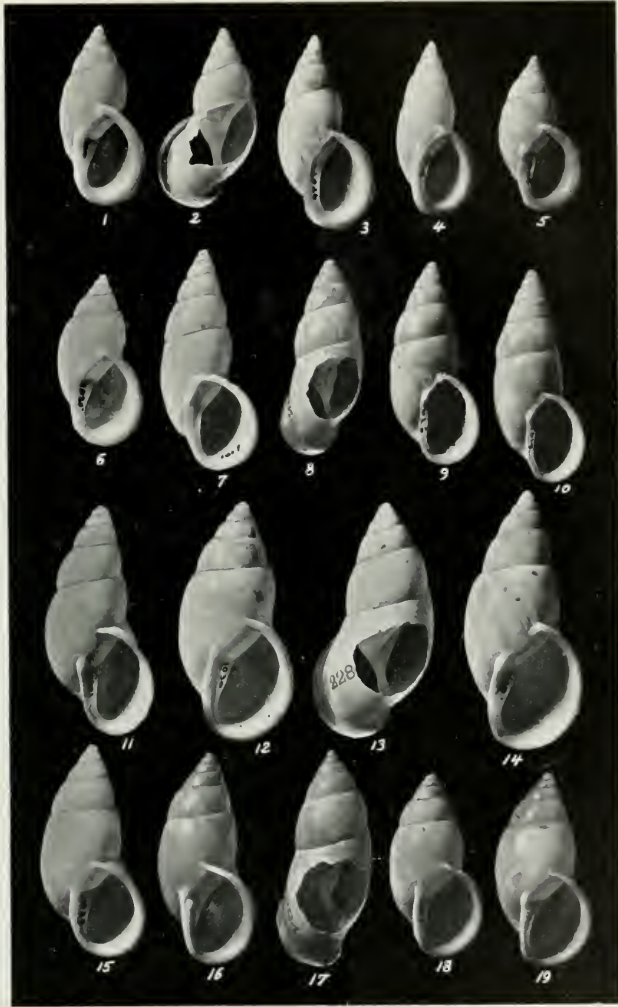


PLATE VIII

(All figures enlarged to 1.14 diameters.)

Figs. 1-3. *Bulinulus veseyianus* Dall; plesiotypes Nos. 1039-1041 (C.A.S. Type Coll.) from Espiritu Santo Island, Gulf of California; p. 499.

Fig. 4. *Bulinulus ximenez*, new species; type No. 1042 (C.A.S. Type Coll.) from Carmen Island, Gulf of California; p. 497.

Figs. 5-9. *Bulinulus ximenez*, new species; paratypes Nos. 1043-1047 (C.A.S. Type Coll.) from Carmen Island, Gulf of California; p. 497.

Fig. 10. *Bercndtia taylori* (Pfeiffer); plesiotype No. 1089 (C.A.S. Type Coll.) from Puerto Escondido, Lower California (Gulf side); p. 506.

Figs. 11-13. *Micrarionta exanimata* (Cooper); plesiotypes Nos. 1100-1102 (C.A.S. Type Coll.) from Monserrate Island, Gulf of California; p. 505.

Figs. 14-15. *Micrarionta peninsularis* (Pilsbry); plesiotypes Nos. 1103-1104 (C.A.S. Type Coll.) from Angeles Bay, Lower California (Gulf side); p. 503.

Figs. 16-20. *Bulinulus dentifer* Mabille; plesiotypes Nos. 1048-1052 (C.A.S. Type Coll.) from Tortuga Island, Gulf of California; p. 492.

Fig. 21. *Bulinulus chamberlini*, new species; type No. 1023 (C.A.S. Type Coll.) from San Diego Island, Gulf of California; p. 494.



PLATE IX

(All figures enlarged 2.0 diameters.)

Figs. 1-2. *Calocentrum irregulare* (Gabb); plesiotypes (part of type lot) Nos. 1053-1054 (C.A.S. Type Coll.) from Mulegé, Lower California (Gulf side); p. 508.

Fig. 3. *Calocentrum oceanii*, new species; type No. 1055 (C.A.S. Type Coll.) from Agua Grande, Carmen Island, Gulf of California; p. 511.

Figs. 4-8. *Calocentrum oceanii*, new species; paratypes Nos. 1056-1060 (C.A.S. Type Coll.) from Agua Grande, Carmen Island, Gulf of California; p. 511.

Fig. 9. *Calocentrum insulare*, new species; type No. 1061 (C.A.S. Type Coll.) from Puerto Bellandra, Carmen Island, Gulf of California; p. 509.

Figs. 10-17. *Calocentrum insulare*, new species; paratypes Nos. 1062-1070 (C.A.S. Type Coll.) from Puerto Bellandra, Carmen Island, Gulf of California; p. 509.

Figs. 18-24. *Calocentrum insulare*, new species; paratypes Nos. 1071-1077 (C.A.S. Type Coll.) from Santa Catalina Island, Gulf of California; p. 509.

Figs. 25-26. *Calocentrum insulare*, new species; paratypes Nos. 1078-1079 (C.A.S. Type Coll.) from Monserrate Island, Gulf of California; p. 509.

Figs. 27-28. *Calocentrum insulare*, new species; paratypes Nos. 1080-1081 (C.A.S. Type Coll.) from Danzante Island, Gulf of California; p. 509.

Fig. 29. *Calocentrum clavigeroi*, new species; type No. 1082 (C.A.S. Type Coll.) from Agua Verde Bay, Lower California (Gulf side); p. 512.

Fig. 30. *Calocentrum clavigeroi*, new species; paratype No. 1083 (C.A.S. Type Coll.) from Agua Verde Bay, Lower California (Gulf side); p. 512.

Fig. 31. *Calocentrum vanduzeei*, new species; type No. 1085 (C.A.S. Type Coll.) from Puerto Escondido, Lower California (Gulf side); p. 508.

Figs. 32-34. *Calocentrum vanduzeei*, new species; paratypes Nos. 1086-1088 (C.A.S. Type Coll.) from Puerto Escondido, Lower California (Gulf side); p. 508.

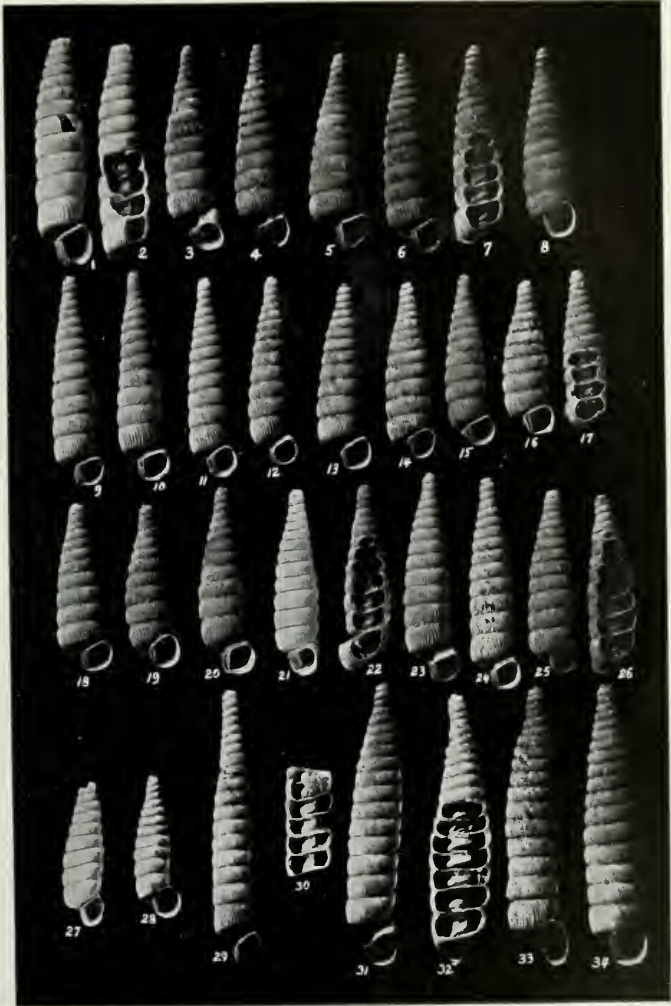


PLATE X

Fig. 1. *Pupoides catalinensis*, new species; type No. 1090 (C.A.S. Type Coll.) from Santa Catalina Island, Gulf of California; enlarged 19.5 diameters; p. 514.

Figs. 2-4. *Pupoides catalinensis*, new species; paratypes Nos. 1091-1093 (C.A.S. Type Coll.) from Santa Catalina, Gulf of California; enlarged 19.5 diameters; p. 514.

Fig. 5. *Gastrocopta rixfordi*, new species; type No. 1094 (C.A.S. Type Coll.) from Monserrate Island, Gulf of California; enlarged 17.2 diameters; p. 515.

Figs. 6-8. *Gastrocopta rixfordi*, new species; paratypes Nos. 1095-1096 (C.A.S. Type Coll.) from Monserrate Island, Gulf of California; enlarged 17.2 diameters; p. 515.

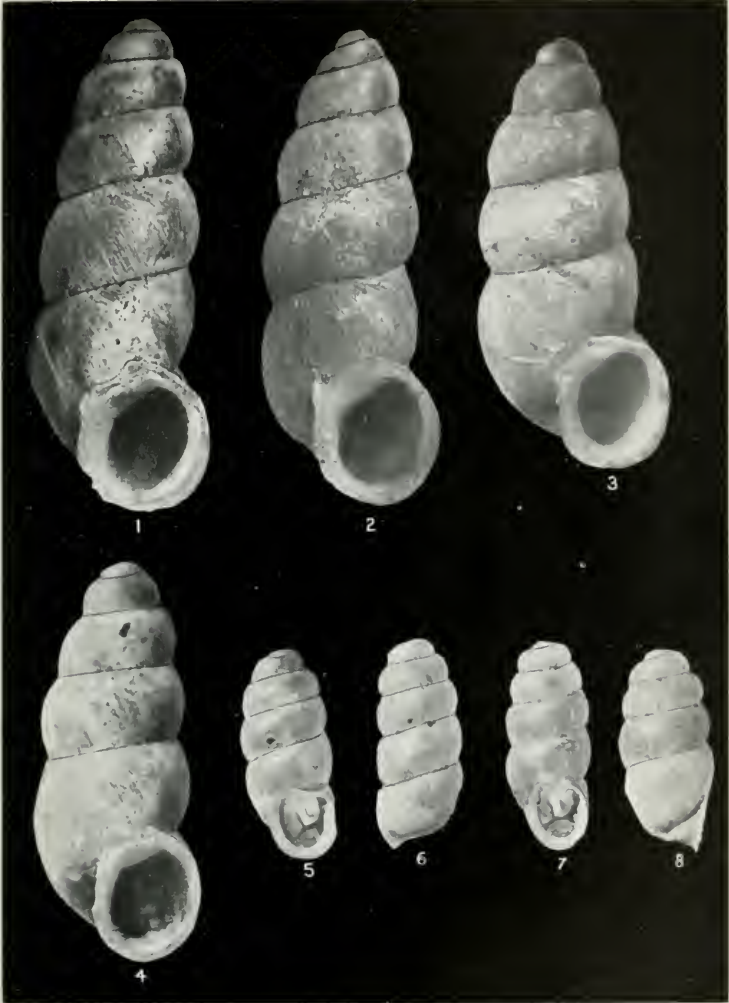


PLATE XI

Fig. 1. *Micrarionta peninsularis* (Pilsbry); plesiotype No. 1103 (C.A.S. Type Coll.) from Angeles Bay, Lower California (Gulf side); enlarged 24.6 diameters; p. 503.

Fig. 2. *Bulinulus ceralboensis*, new species; paratype No. 1022 (C.A.S. Type Coll.) from Ceralbo Island, Gulf of California; enlarged 31.9 diameters; p. 490.

Fig. 3. *Bulinulus johnstoni*, new species; type No. 1024 (C.A.S. Type Coll.) from Santa Catalina Island, Gulf of California; enlarged 24.6 diameters; p. 491.

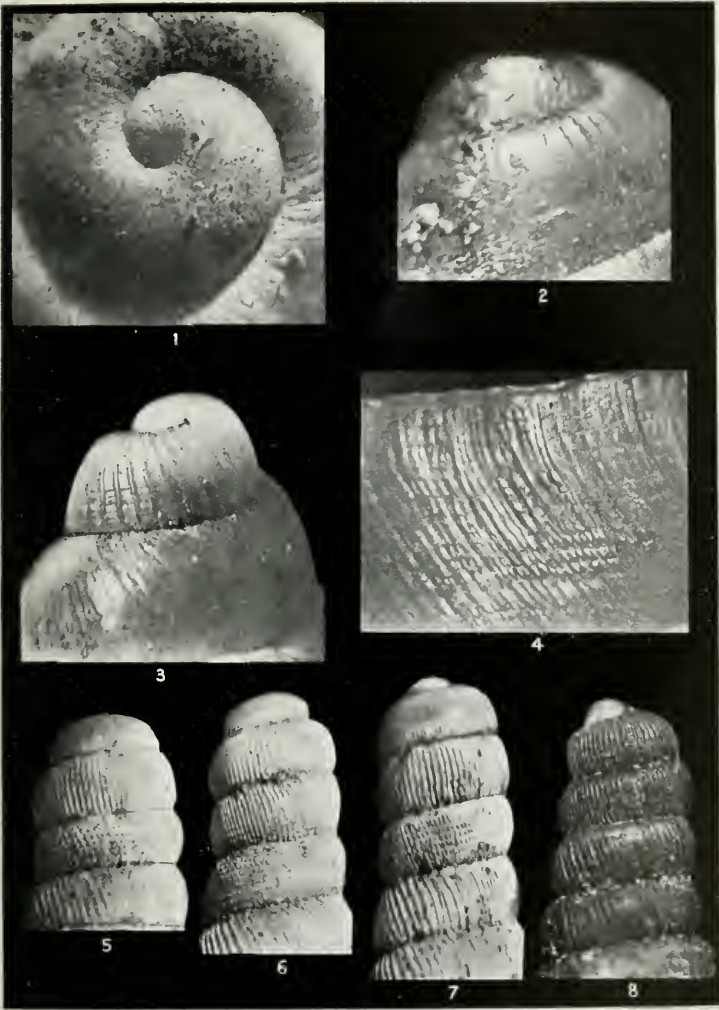
Fig. 4. *Bulinulus ceralboensis*, new species; paratype No. 1022 (C.A.S. Type Coll.) from Ceralbo Island, Gulf of California; enlarged 17.9 diameters; p. 490.

Fig. 5. *Calocentrum insulare*, new species; type No. 1061 (C.A.S. Type Coll.) from Bellandra Bay, Carmen Island, Gulf of California enlarged 12.9 diameters; p. 509.

Fig. 6. *Calocentrum clavigeri*, new species; type No. 1082 (C.A.S. Type Coll.) from Agua Verde Bay, Lower California (Gulf side); enlarged 12.9 diameters; p. 512.

Fig. 7. *Calocentrum vanduzeei*, new species; type No. 1085 (C.A.S. Type Coll.) from Puerto Escondido, Lower California; enlarged 12.9 diameters; p. 508.

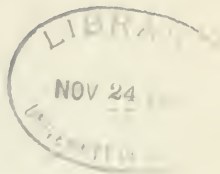
Fig. 8. *Calocentrum oweni*, new species; type No. 1055 (C.A.S. Type Coll.) from Agua Grande, Carmen Island, Gulf of California; enlarged 12.9 diameters; p. 511.



PROCEEDINGS
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XXVII

EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹

THE BEES (II)

BY

T. D. A. COCKERELL

University of Colorado

HYLÆIDÆ (PROSOPIDIDÆ)

HYLÆUS Fabricius

(PROSOPIS Fabricius)

The species in the collection are readily separable thus:

Clypeus entirely black; female.	<i>asininus</i> (Cockerell & Casad)	
Clypeus entirely light; males.		1
Clypeus marked with black and light; females.		2
1. Larger; supraclypeal mark present.	<i>asininus</i> (Cockerell & Casad)	
Smaller; supraclypeal mark absent.	<i>aztecus</i> (Cresson)	
2. Supraclypeal mark present.	<i>sonorensis</i> n. sp.	
Supraclypeal mark absent.		3
3. Larger; light mark on clypeus narrow above, with much the outline of a church steeple.	<i>sonorensis melanorhinus</i> n. var.	
Smaller; light mark on clypeus broad, obtuse above.	<i>aztecus</i> (Cresson)	

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

March 22, 1924

51. *Hylæus asininus* (Cockerell & Casad)

Las Animas Bay, May 8, 2♀, 1♂. In the females the face-marks are yellower than in specimens from the Mesilla Valley, New Mexico. This species was previously known from New Mexico and Arizona.

52. *Hylæus aztecus* (Cresson)

San Evaristo, June 10, 2♂; Guadalupe Point, Concepcion Bay, June 17, 1♂, 2♀; San Esteban Island, April 19, 5♀, one labelled "sage"; Guaymas, April 8 to 10, 3♀; Agua Verde, May 26, 1♀; Tortuga Island, May 11, 1♀. This has been known as a species of tropical Mexico; I have it from the Rio Nautla, State of Vera Cruz, collected by C. H. T. Townsend. Cresson described only the female. The male runs in my table to *P. nevadensis*, but in that of Metz to *P. polifolii*, but it is abundantly distinct from both. It is only about 4 mm. long, the face-markings are creamy-white, and the orbits converge strongly below. The lateral marks are shaped like a closed hand with a very long index finger pointed, the abruptly separated linear upward extension being very distinctive. Thus it is very easily separated from *polifolii* and *nevadensis*. The pale collar is interrupted in the middle, the tubercles are pale. The knees, tibiae in large part and all the tarsi are creamy-white or pale yellowish. The stigma is sepia-brown.

53. *Hylæus sonorensis*, new species

♀. Length about 6.5 mm.; black, with extremely scanty pale hair, forming however distinct white bands at sides of first abdominal segment; light markings very pale yellow (face marks in type turned somewhat orange by cyanide), consisting of the face-markings, upper border of prothorax (not interrupted), tubercles, pyriform spot on tegulae, basal part of tibiae (on front tibiae with a line extending apicad), and middle and hind basitarsi, except apically; clypeus with lower part yellow, this color extending upwards as a cuneiform mark, ending obtusely just before apex, and having on each side a small rounded extension; supraelypeal mark broad-triangular; lateral marks shaped like feet with very long toes, ending broadly and obtusely about half-way up front; flagellum ferruginous beneath; mesothorax dull, finely and extremely densely punctured; scutellum somewhat shining; with distinctly separated punctures; area of metathorax coarsely rugose; mesopleura finely and closely punctured; wings hyaline, with dark stigma and nervures; first recurrent meeting intercubitus; abdomen broad, first segment shining, finely punctured; margin of second segment somewhat upturned. The second abdominal segment is transversely lineate, and the excessively minute punctures are only visible under the

compound microscope. The microscope shows that the clypeus is very finely longitudinally striate.

Variety *melanorhinus*, n. var. Supraclypeal mark absent; clypeal mark reduced to a transverse apical band supporting an upward extension which is narrowly pointed, in outline like a church steeple.

Guaymas, Mexico (Van Duzee), the type (19) April 10, the variety (19) April 8. There is some resemblance to *H. mexicanus* (Cresson), but that has the scutellum yellow, and the face narrower above. The species seems to be more related to those of tropical Mexico than to species of the United States.

Type: Female, No. 1496, Mus. Calif., Acad. Sci., and *type* of variety, female, No. 1497, collected at **Guaymas, Sonora**.

COLLETIDÆ

COLLETES Latreille

54. *Colletes daleæ* Cockerell

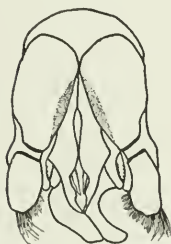


Fig. 1. Male genitalia.



Fig. 2. Seventh ventral plate.

Males: Three from S. Francisquito Bay, May 10; seven from Guaymas, April 8; one from Escondido Bay, June 14.

Females: One from S. Francisquito Bay, June 23; six from Guaymas, April 7 to 15; one from Guadalupe Point, Concepcion Bay, June 17; one from Angeles Bay, May 7; three from Bay south end of Tiburon Island, May 5.

C. daleæ was described from the male, collected in the Mesilla Valley, New Mexico, at flowers of *Dalea scoparia*

(*Parosela scoparia*). The female has remained unknown, but I think there can be no doubt that the females recorded above belong to this species. They are however, so close to *C. algarobiæ* Ckll., found in the Mesilla Valley at flowers of *Prosopis glandulosa*, that were it not for the males I might regard them as a race of that species. The male *daleæ* is easily known from that sex of *algarobiæ* by the dark tarsi, these being clear bright ferruginous in the latter species. Compared with *C. algarobiæ*, the female *C. daleæ* seems to average smaller; the base of metathorax is sculptured with heavy ridges, closely set together except sometimes in the middle; the wings are clearer; the clypeus is highly polished and more sparsely punctured, always with an evident median sulcus. The general aspect is, however, exactly the same, and the species are very closely allied. The pale greyish or brownish hair on the scutellum is never conspicuous, and the more usual form has the hair of the thorax above entirely white (as in the male), or a slight dusky shade can be seen with difficulty. In *C. algarobiæ*, so far as observed, the females have about as much dark hair on the thorax above as in the darkest specimens of *C. daleæ*. In *C. algarobiæ* female the anterior and middle knees are narrowly red; this is not the case in *C. daleæ*.

In the male of *C. daleæ* the seventh ventral plate is of the short type, rather closely similar to that of the European *C. brachycerus* Swenk (*C. brevicornis* Pérez) as figured by Morice. The genitalia also quite closely resemble those of *C. brachycerus*, so there may be some real affinity. Among the American species figured by Swenk the genitalia resemble those of *C. validus* Cresson, but the seventh ventral plate of *C. daleæ* is quite different in detail, though of the same broad and abbreviated type.

55. *Colletes algarobiæ* Cockerell

One female from Guaymas, April 7, exactly agrees with this species.

56. *Colletes albocinctus*, new species

Fig. 3. Seventh ventral plate.

♂. (Type). Length about 10 mm., anterior wing 7 mm.; black, including tarsi and antennæ, the flagellum very faintly brownish beneath; tegulæ dusky ochreous, shining; wings hyaline, faintly dusky; stigma short, dusky rufous, nervures black; hair of head and thorax long and abundant, white on face, pleura and under parts, dorsally pale greyish ochreous, mixed with fuscous on vertex and scutellum; face broad; eyes dark brown; malar space about as long as broad; flagellum long and stout, middle joints long; mesothorax and scutellum highly polished, the first practically impunctate, the scutellum with scattered distinct punctures on apical half; mesopleura rather closely punctured; base of metathorax, above the transverse keel, presenting a rather broad transverse band crossed by strong sharp ridges, separating shining areas which are longer than broad; second cutital cell broad, receiving recurrent nervure about middle; legs ordinary, spurs pallid; abdomen shining, with extremely fine punctures; hind margins of segments with entire rather broad white hair-bands; dorsum of segments 4 and 5 with short black hair; ventral segments 2 to 4 with narrow marginal white bands. Seventh ventral plate of the elongate type, resembling in a general way that of *C. macconnelli* Metz from Guadalajara; but differs in details, and that species has the abdomen densely punctured, and with yellowish hair-bands.

♀. Length about or nearly 12 mm., resembling the male, except for the usual sexual differences. Clypeus convex, very coarsely but sparsely punctured, with a strong median sulcus; vertex and scutellum with greyish brown hair, and a little of the same intermixed on disc of mesothorax; malar space more than twice as broad as long, but not linear; tegulæ reddish-ochreous; stigma very dark reddish; abdominal bands broad.

Type: Male, No. 1498, Mus. Calif. Acad. Sci., collected by Van Duzee June 30, at Pond Island Bay, Angel de la Guarda Island, Gulf of California.

The female is from San Evaristo, Lower California, June 10 (Van Duzee). Although the localities are far apart, I think there can be no mistake in associating the sexes.

The male is very like *C. intermixtus* Swenk, but the seventh ventral plate is wholly different. In my table of male *Colletes*, *C. albocinctus* runs to *C. gaudialis*, which it really resembles very much, but the abdomen and base of metathorax are

quite different. The female runs in tables to *C. texanus* Cresson or *C. algarobiæ* Cockerell, but is much larger than these. The female resembles in a general way *C. armatus* Patton, but is easily distinguished by the excessively weak, evanescent punctures of first abdominal segments. There is also some resemblance to *C. mexiconis* Strand, described from Tehuacan, some 220 miles southeast of Mexico City.

57. *Colletes mulegensis*, new species



Fig. 4. Seventh ventral plate.

♂. Length about 8 mm.; similar to *C. albocinctus*, but differing thus: Malar space distinctly broader than long; hair of head and thorax white, a scarcely perceptible yellowish tint on vertex; stigma much redder; tarsi decidedly rufescent apically. The species are, however, very closely allied, and have the same type of seventh ventral plate, differing only in minor details. The elongate lobes of the plate are broader and blunter than in *C. albocinctus*, and the broader elongate patch of hair reaches the inner margin of the lobes, instead of leaving a free space as in *C. albocinctus*. There can be no doubt that these two species and *C. macconnelli* Metz are to be associated to form a little group of the genus, so far as at present known confined to Mexico.

Type: A male, No. 1499, Mus. Calif. Acad. Sci., collected by Van Duzee, May 14, at Mulegé, Lower California.

In my table of male *Colletes* this runs to *C. gaudialis*, and does in fact closely resemble it, though easily distinguished by the structure of metathorax. The transverse band above the keel being very much narrower in *gaudialis*. The abdomen of *gaudialis* is much more shaggy, with longer and more abundant hair on first segment.

58. *Colletes profectus*, new species

♂. Length about 8.5 mm., anterior wing 5.3 mm.; slender, black, with entirely ferruginous tarsi; flagellum very long, very obscurely brownish beneath; mandibles red at the bidentate apex; malar space considerably longer than wide, but not nearly twice as long; hair of head and thorax long and abundant, pure white throughout; face broad; mesothorax and scutellum highly polished, practically impunctate; basal band of metathorax, above the keel, unusually broad, polished, with only a few feeble imperfect plicæ about the middle; tegule reddish-brown; wings clear hyaline; stigma pale brownish with a dark margin; nervures brown, second cubital cell broad, receiving recurrent nervure about middle; legs slender, hind tarsi long; abdomen narrow, subcylindrical, distinctly glaucous, the punctures so fine as to be hardly perceptible under a lens; six entire pure white hair bands.

Type: A male, No. 1500, Mus. Calif. Acad. Sci., collected by Van Duzee, April 23, at Freshwater Bay, Tiburon Island.

In my table runs to *C. gaudialis*, but is entirely different. On account of the long flagellum and red tarsi it resembles *C. algarobia*, but the malar space and base of metathorax will at once distinguish it. By the slender form and general appearance it resembles *C. daleæ*.

59. *Colletes perileucus*, new species

♀. Length about 11.5 mm., anterior wing about 7.3; robust, black, including tarsi, mandibles and tegule, but flagellum obscure brownish beneath; hair of head and thorax white, but black on vertex, disc of mesothorax, and scutellum; head broad; malar space more than twice as broad as long, but not linear; labrum with two strong median ridges; clypeus densely and coarsely striate-punctate, distinctly depressed in middle; a polished impunctate area above each eye; mesothorax coarsely and densely punctured anteriorly and at sides, the posterior middle smooth; scutellum smooth anteriorly, rugosopunctate posteriorly; basal band of metathorax, above the keel, broad, with strong plicæ which only go about half way, leaving a shining apical transverse band or channel, but the whole basal region is usually hidden by the over-lapping hair of postscutellum; mesopleura strongly punctured; wings hyaline, the short stigma very dark reddish, nervures black; second cubital cell very broad, much broader on marginal cell than first or third; legs ordinary, red at base of claws, spurs red; tufts of red hair at apices of joints of hind tarsi; abdomen broad, shining, with extremely weak and minute punctures; five rather broad even pure white hair-bands; hind spur with about 20 very fine oblique teeth.

Type: A female, No. 1501, Mus. Calif. Acad. Sci., collected by Van Duzee, April 15, at Guaymas, Mexico. Two other females taken at same place, April 7 to 15, 3 ♀ (Van Duzee).

In my table of New Mexico species, this runs out next to the much smaller *C. texanus*. In Swenk's table of species with dark hair on thorax above it runs to *C. scopiventer* Swenk, from Texas, but that is only 9.5 mm. long, and is

closely allied to *C. texanus*. The hind spur of *C. perileucus* is formed as in *C. scopiventer*, not as in *C. texanus*.

The above species may be separated as follows:

Females.....	1
Males.....	4
1. Comparatively large, robust species, 11 mm. long or over; malar space short.....	2
Smaller, usually more slender species; malar space well developed, but not longer than broad.....	3
2. Tegulae pale reddish; darker hairs of scutellum only pale brownish.....	
..... <i>albocinctus</i> , n. sp.	
Tegulae black; darker hairs of scutellum black or blackish.....	
..... <i>perileucus</i> , n. sp.	
3. Clypeus with no median sulcus; anterior and middle knees red.....	
..... <i>algarobia</i> Ckll.	
Clypeus with a median sulcus; anterior and middle knees not red.....	
..... <i>dalea</i> Ckll.	
4. Robust species, with broad abdomen; tarsi not red.....	5
Small or slender species.....	6
5. Hair of head and thorax above strongly tinted with brown; malar space about as long as broad.....	
..... <i>albocinctus</i> n. sp.	
Hair of head and thorax above dull white; malar space distinctly broader than long.....	
..... <i>mulegensis</i> n. sp.	
6. Tarsi red.....	
..... <i>prosectus</i> n. sp.	
Tarsi dark.....	
..... <i>dalea</i> Ckll.	

I am greatly indebted to Miss Grace Sandhouse for preparing and drawing the abdominal structures of three of the species.

ANDRENIDÆ

HALICTINÆ

AGAPOSTEMON Smith

The material of this genus is particularly interesting. It consists of six species, one of which (*A. nasutus* Smith) is a well-known neotropical form. It is interesting to note that it was collected only at La Paz, near the end of the Peninsula. All the others are closely allied to described species, yet in every case appreciably distinct. I treat them as species, but some or all may later be reduced to subspecific rank. The *A. digueti* was actually discovered in Lower California by Diguët, the well-known French explorer of that region. Vachal recorded Diguët's specimen as *A. melliventris* Cresson, but gave enough information to show clearly what he had. Fox reported a female of *A. melliventris* from San José del Cabo; possibly it was really *diguëti*, but there is nothing to

show this, beyond the locality. The forms present in the collection may be separated thus:

Abdomen green; females	1
Abdomen not green.....	2
1. Area of metathorax coarsely ridged or plicate.....	<i>angelicus</i> n. sp.
Area of metathorax finely ridged or striate.....	<i>proscriptellus</i> n. sp.
2. Mesothorax purple; abdomen black; female.....	<i>purpureopictus</i> n. sp.
Mesothorax emerald green.....	3
3. Males.....	4
Females.....	<i>digueti</i> n. sp.
4. Region above mouth flattened, snout-like.....	<i>nasutus</i> Smith
Region above mouth ordinary.....	5
5. Hind femora robust, with a tooth beneath; base of first abdominal segment black.....	<i>cyanozonus</i> n. sp.
Hind femora slender, without a tooth; base of first abdominal segment very pale reddish.....	<i>digueti</i> n. sp.

60. *Agapostemon nasutus* Smith

La Paz, June 3 to 5, 3 ♂. The female was not obtained; it would run in the above table to *A. digueti*, from which it is easily known by the entirely black abdomen and dark hairs on scutellum.

61. *Agapostemon angelicus*, new species

♀. Length about 10 mm.; bright emerald green, with white hair, including that on thorax above, but that at apex of abdomen black; apex of clypeus broadly black, with no yellow band; labrum black, basal half of mandibles yellow; flagellum dusky ferruginous beneath, bright on last joint; mesothorax highly polished, with very fine and delicate punctures, and scattered larger (but still small) ones; truncation of metathorax very sharply defined; basal area with no defined space, but with very coarse longitudinal plicæ, a small triangular space in the middle rather bluer green and more finely sculptured; mesopleuræ very coarsely rugose; tegulæ pale testaceous with a yellow spot; wings hyaline, a little dusky, stigma clear ferruginous; legs black, tarsi reddish at tip, anterior and middle knees yellow, hind tibiæ with dark brown hair on hinder margin; abdomen closely and finely punctured, but shining, bases of segments 2 to 4 with broad bands of white tomentum; venter black.

Type: A female, No. 1502, Mus. Calif. Acad. Sci., collected at Pond Island Bay, Angel de la Guarda Island, July 1 (Van Duzee).

Runs in Crawford's and Vachal's tables straight to *A. texanus* Cresson, but has the base of metathorax after the manner of *A. radiatus* (Say). The mesothorax is more polished than in *texanus*, and the second and third cubital cells are shorter. It therefore seems proper to consider it a distinct though closely allied species.

62. *Agapostemon proscriptellus*, new species

♀. Length about 9.5 mm., bright green, a distinctly bluer green than *A. angelicus*; pubescence white, black at apex of abdomen; head broad; clypeus elevated in middle, apex broadly black; labrum dusky red; mandibles dull whitish subbasally; flagellum dull red beneath; mesothorax dullish, extremely finely and closely punctured, with slight indications of scattered punctures in the style of *texanus*; metathorax sharply truncate, its base finely rugose, without a distinct area; mesopleura rugose; tegulae hyaline, testaceous posteriorly, with an obscure yellow spot; wings faintly dusky, stigma light ferruginous; trochanters, and femora except apical spot, black; anterior and middle knees yellow; tibiae and tarsi red, the anterior and middle tibiae suffused with black; abdomen shining, extremely finely punctured, black bands across first three segments, weak and incomplete on third; white tomentum at bases of segments 2 to 4; venter black, reddened on first two segments.

Type: No. 1503, Mus. Calif. Acad. Sci., collected at **Guaymas, Mexico**, April 8 (Van Duzee). 1 ♀.

In Vachal's table this falls near what he doubtfully referred to *A. pulcher* Smith, a species described from California. *A. pulcher*, according to Smith, has rufotestaceous legs. Robertson in 1902 said it was the female of *A. femoratus* Crawford. In the North American fauna, *A. proscriptellus* is really closest to *A. cockerelli* Crawford; but its closest relative is tropical, namely *A. proscriptus* Cockerell from Guatemala City, Guatemala. Compared with *A. proscriptus*, it is much bluer green, with the orbits more converging below, and the pubescence much whiter. The wings of *proscriptus* are redder. The form is therefore readily separable, whether regarded as a species or a race.

63. *Agapostemon purpureopictus*, new species

♀. Length about 10 mm.; head and thorax blue-green, strongly suffused with brilliant purple on face and front, mesothorax, scutellum and postscutellum, and sides of thorax, but the purple areas on mesothorax and front dull; pubescence white, mixed with black on thorax above, on occiput faintly yellowish, apex of abdomen with black hair; head very broad; clypeus with a dull yellow submarginal band; labrum black; mandibles dull yellowish-white basally; flagellum bright ferruginous beneath; mesothorax dull and very finely and densely punctured; anterior edge of scutellum shining; metathorax sharply truncate, the broad basal part coarsely rugose laterally striate, without a defined area; mesopleura very finely rugose; tegulae ferruginous with a yellow spot; wings faintly dusky, conspicuously so on apical margin, stigma dull red; legs black, small joints of tarsi red; hind tibiae with pure black hair posteriorly, and pale golden on inner side; their tarsi also have dark hair on outer side of first two joints, but apical brush of basitarsi is brilliant copper-red; abdomen black, shining, very finely punctured; basal bands of tomentum on segments 2 to 4 very broad and distinct.

Type: No. 1504, Mus. Calif. Acad. Sci., collected at Guaymas, Mexico, April 8 (Van Duzee). 1 ♀.

Runs in Crawford's table to *A. fasciatus* Crawford, but easily distinguished by the purple color. It is a more robust insect than *fasciatus*, with much broader face. In Vachal's table it runs to the vicinity of *A. nasutus* Smith and *A. leunculus* Vachal, but is quite distinct by the purple color and other features. The real affinity is evidently with *A. nasutus*, from which it has presumably been derived. *A. nasutus* var. *gualanicus* Cockerell, from Guatemala, has (male) a purple metathorax, so it may be that intermediates will be found between ordinary *nasutus* and the insect now described.

64. *Agapostemon digueti*, new species

♀. (Type). Like *A. melliventris* Cresson, but easily distinguished by having four very broad black bands on the abdomen. In one specimen (Angeles Bay) the first two of these bands are absent, the second however, represented by a narrower dusky shade; thus the first two segments are clear red, an evident transition toward *melliventris*. The scape, as in *melliventris*, has a yellow stripe.

♂. Almost exactly like *melliventris*, but averaging larger, with broader bands on abdomen. This could be regarded as a subspecies of *A. melliventris*, especially in view of the one intermediate specimen.

Type: No. 1505, Mus. Calif. Acad. Sci., collected at Las Animas Bay, Lower California, May 8 (Van Duzee), 11 ♀; Guaymas, April 8, 1 ♀; Angeles Bay, 5 ♀ June 25, 1♂ June 27; Agua Verde, May 26, 1 ♀; San Fancisquito Bay, May 10, 1 ♀; San Francisco I., May 30, 2 ♂; Pond I. Bay, Angel de la Guarda I., June 30, 8 ♂; Loreto, May 30, 12 ♂; San Marcos I., May 12, 2 ♂; La Paz, June 3 to 4, 3 ♂; San Nicholas Bay, May 16, 1 ♂. All collected by E. P. Van Duzee.

65. *Agapostemon cyanozonus*, new species

♂. Length about 9 mm., anterior wing 5.8 mm.; a member of the group with moderately thick hind femora, having a tooth beneath near apex; apical part of the broad abdominal bands steel-blue; trochanters yellow and black, the first four broadly yellow in front, the hind pair with about apical half yellow; first ventral segment of abdomen with a large green patch at base, the rest very pale reddish, emarginate apically; second ventral yellow, with an apical pale red band; third similarly colored, but the reddish region with a pair of transverse thickenings, convex caudad; fourth with a very thick curved dusky callus; apical segment with no keel. This species is so close to several others that it is best separated by comparisons.

- (a) From *A. virescens* (Fab.) it is easily known by the mainly light ventral surface of abdomen and lack of keel on last ventral.
- (b) From *A. coloradensis* Crawf., by the much smaller size, emerald green head and thorax (without blue or purple), and pale venter of abdomen.
- (c) From *A. radiatus* (Say), by the light hair on apex of abdomen above, the more delicately sculptured base of metathorax, clear wings and more pointed stigma.
- (d) From *A. brachycerus* (Vachal), by the color of trochanters and the distinctly larger size. I cannot make anything tangible of the supposed difference in the antennæ said to distinguish *brachycerus*.
- (e) From *A. fasciatus* Crawf., by the color of trochanters (entirely green in *fasciatus*), small dark stripe on hind tibiæ, elongate black patch on middle tibiæ, and partly blue abdominal bands.
- (f) From *A. californicus* Crawf., (which has the blue on abdominal bands), by the smaller size, lack of black bands on second and third ventral segments, second cubital cell higher than broad (broader than high in *californicus*), base of metathorax less finely sculptured, and posterior truncation brilliantly shining.
- (g) From *A. texanus* Cresson, by the smaller size, lack of a black band on inner side of hind tibiæ, lack of black bands on ventral segments 2 and 3, fourth ventral with a continuous callus (in *texanus* two calli, separated by a smooth metallic area.)
- (h) From *A. texanus subtilior* Ckll., by the color of trochanters, and characters similar to those which distinguish *texanus*.

The closest affinity is with *A. californicus*, but in that the callus on fourth ventral segment is more distinctly though narrowly interrupted, *californicus* in this respect being intermediate between *cyanozonus* and *texanus*.

Type: No. 1506, Mus. Calif. Acad. Sci., collected at Guaymas, Mexico, April 7 (Van Duzee), 1 ♂.

By the sculpture of the metathorax, this cannot be the male of *A. angelicus*.

NOMINÆ

The following species was overlooked when dealing with *Nomia*:

66. *Nomia howardi vanduzeei*, new subspecies

♀. Rather larger, length fully 10 mm.; punctures of clypeus conspicuously running into striae; scutellum with scattered fine punctures on middle; legs black, the hind pair dark brown on inner side. Additional characters are: flagellum bright ferruginous beneath, except first joint; pubescence in general white, a little black hair on disc of mesothorax and scutellum; apical part of abdomen with black hair, chocolate at tip, but shining white hair on venter and showing at extreme sides of fifth segment, viewed from above; stigma picuous; abdominal bands very pale greenish suffused with light yellow, the narrower first band blue-green.

Type: No. 1509, Mus. Calif. Acad. Sci., collected at Loreto, Lower California, May 20 (Van Duzee).

It is really impossible to say whether this is an individual variation of *N. howardi* Crawford (described from one specimen collected at San José de Guaymas), or a distinct race, or a separate species. Crawford's description is rather insufficient, and more material is required. *N. howardi vanduzeei* is much smaller than *N. californica*, the abdominal bands are much paler, the second to fourth not nearly so broad, the antennæ are differently colored, the tegulæ are redder, and the base of the second abdominal segment has larger punctures.

PANURGIDÆ

When reporting on the Panurgidæ last year the following species were overlooked.

HESPERAPIS Cockerell, 1898

A genus known from the southwestern United States; for details see Psyche, 1916, p. 176.

67. *Hesperapis macrocephala*, new species

♀. Length about 10.5 mm.; black, with white hair, faintly yellowish on upper part of head, and red on inner side of tarsi; head extremely broad, facial quadrangle broader than long; mandibles bidentate, obscurely rufescent apically; clypeus polished, minutely rugulose and dull above, the punctures so fine as to be barely visible under a lens; face and front with long white hair; flagellum short and thick, dusky red beneath; vertex dull and minutely granular; hair of thorax above not moss-like; mesothorax and scutellum dullish, somewhat shining, without distinct punctures as seen under a lens, but the microscope shows fine very dense punctures on a dull surface; pleura covered with long hair, hiding the surface; area of metathorax dull; tegulæ reddish-testaceous; wings dusky-hyaline, stigma elongate-lanceolate, dusky reddish; nervures fuscous; second cubital cell receiving recurrent nervures about equally far from base and apex; legs black, with white hair; spurs white, slightly brownish apically; abdomen broad and flattened, dullish, first segment more shining; hind margins of segments broadly pallid, but covered by broad white hair-bands; apical plate long and narrow, with a delicate, but very distinct median keel. The type carries large masses of consolidated hard pollen on the hind tibiæ.

Type: No. 1510, Mus. Calif. Acad. Sci., collected at San Francisco Bay, Lower California, May 10 (Van Duzee).

1 ♀.

Nearest to *H. semirudis* Cockerell, from the San Jacinto Mountains, California, but easily separated by the much broader head, and much narrower, more pointed apical plate of abdomen.

68. *Hesperapis leucura*, new species

♀. Length about 7 mm., black including legs, but mandibles with a broad red median band, and flagellum very bright ferruginous beneath; pubescence white, faintly greyish or yellowish (not moss-like), on head and thorax above, pale reddish on inner side of tarsi; head broad, facial quadrangle about square, eyes greyish-green; clypeus shining, front dull, but vertex shining; mesothorax dull, posterior middle glistening; under the microscope the mesothorax appears very minutely but not densely punctured, and the marginal area all around carries very minute moss-like hairs, distinct from the long erect hairs noticeable on first inspection; area of metathorax shining; sides of metathorax with long white hair; mesopleura strongly convex, shining; tegulae testaceous; wings very faintly dusky; stigma lanceolate, dusky red, nervures fuscous; second cubital cell rather short; tibiae and tarsi densely covered with white hair; abdomen broad, dullish, with broad white hair-bands; fifth segment and apex densely covered with white hair; apical plate reddish, rather broad, truncate and emarginate, its basal middle with a microscopically tessellate sculpture.

Type: No. 1511, Mus. Calif. Acad. Sci., collected at San Francisquito Bay, Lower California, May 10, (Van Duzee).

2 ♀.

Somewhat related to *H. rhodocerata* Cockerell, but much smaller.

CERATINIDÆ

CERATINA Latreille

69. *Ceratina nanula* Cockerell

Guaymas, Mexico, April 10, 1 ♂. This specimen caused me some perplexity. It agrees with the original description, except that the nervures are distinctly paler. The end of the abdomen is as figured by H. S. Smith for *nanula*, except that there is a distinct bulging of the margin on each side. But the peculiar feature is, that on both sides there are only two cubital cells, the first intercubitus being absent. There is, however, some disturbance of the venation, as there is on the left side an extra vein passing from the basal nervure to the subcosta. On the whole, it seems safe to regard the specimen as an abnormal *C. nanula*.

The northward distribution of *C. nanula* is subject to reconsideration. A male collected by S. A. Rohwer at Boulder, Colorado, has the end of the abdomen as in Smith's figure of *C. acantha*, not as in *C. nanula*. Many years ago, being aware that the Rocky Mountain *Ceratina* needed revision, I sent a quantity of material to Mr. H. S. Smith, who had recently revised the American species. Unfortunately he was never able to proceed with the work. The specimens are, I believe, at the University of Nebraska.

The male of *C. nanula* is easily known from the tropical Mexican *C. nautlana* Cockerell by the sharp angle on hind femur.

70. *Ceratina arizonensis vanduzeei*, new subspecies

♀. Length nearly 4 mm., black, with light tubercles and face-marks; mesothorax punctured anteriorly, smooth and impunctate on disc, posteriorly with a broad rugosopunctate band; scutellum densely punctured posteriorly, sparsely anteriorly, except quite in front where the punctures are denser. The wings are greyish hyaline, in true *C. arizonensis* they are browner. The main point of distinction is in the clypeal mark, which is as broad as the distance between it and the orbits, squarely truncate above, but incised on each side a little below the middle. In *C. arizonensis* female this mark is a comparatively narrow bar.

Type: No. 1507, Mus. Calif. Acad. Sci., collected at Guaymas, Mexico, April 10 (Van Duzee), 1 ♀.

The male may show this to be a distinct species, or it is possible that it is an extreme individual variant of *C. arizonensis*. The anterior knees, tibiæ in front, their tarsi, and small joints of the other tarsi are pale, but the legs are not testaceous as in *C. cockerelli* H. S. Smith, and the scutellum differs. *C. arizonensis* Cockerell is known from Southern California, Arizona and Texas; *C. cockerelli* from Texas. Smith says that the female of *C. cockerelli* has a "rectangular ivory-white mark" on clypeus. This is ambiguous, but might refer to something similar to that in *vanduzeei*.

71. *Ceratina melanoptera*, new species

♂. (*Type*). Length about or slightly over 6 mm.; rather dark olive green; head and thorax well punctured, posterior disc of mesothorax impunctate and black, slightly purplish; trilobed mark almost covering clypeus, large spot on labrum and tubercles ivory white; mandibles black, or obscurely rufescent apically; sides of face with very large but only moderately dense punctures;

antennæ entirely dark; sides of mesothorax sparsely punctured; scutellum sparsely punctured anteriorly, densely posteriorly; cheeks and mesopleura strongly but not densely punctured; area of metathorax basally dull and granular, with a broad shining rim; tegulæ dark rufous, with a very obscure pale spot; wings deep fuliginous, pallid basally; first recurrent nervure joining the large second cubital cell not far from end; anterior femora with an ivory-white spot at apex, and their tibiæ with a narrow stripe, not reaching apex; tarsi rufescent apically; hind femora with a sharp and well-developed dentiform angle below; abdomen closely punctured, and with a snow-white tuft at end.

♀. Length a little over 7 mm.; sides of thorax bluer green; head large; labrum entirely black; clypeus with a pale broad parallel-sided bar, less than half as broad as distance between it and orbits; hind knees with a light spot; hair on inner side of hind tarsi pale fulvous.

The end of the male abdomen is broad, with a median sharp point, after the fashion of *C. atrata* H. S. Smith, except that the dentiform prominence is distinctly larger. *C. atrata* is a minute black species.

Type: No. 1508, Mus. Calif. Acad. Sci., collected at **Guaymas, Mexico**, April 10, 2 ♂ (Van Duzee).

One female from San Pedro Bay, Gulf of California, July 7 (Van Duzee). In H. S. Smith's arrangement this falls nearest to the much larger and otherwise different *C. azteca* Cresson, or the female may be run to *C. neomexicana* Cockerell, from which it differs by the much darker wings, clypeal mark, etc. It is easily known from *C. townsendi* Cockerell by the much less densely punctured sides of face, and different clypeal mark.

It may be worth while to note that Friese in 1910 described a *C. laticeps* from Costa Rica, and in 1921 again described *C. laticeps* as new from the same locality. It is to be hoped that no one will rename the second one, as the descriptions, though differing somewhat, appear to refer to the same species. I have seen this *C. laticeps* in the U. S. National Museum.

Another species described by Friese from Costa Rica (1921), *C. aurata*, is (specimens from Friese in U. S. National Museum) very near *C. amabilis* Cockerell, but differs (♀) by the golden-green (instead of bluish-green) head and thorax, punctures at sides of thorax finer, abdomen crimson rather than magenta. *C. amabilis* from Quirigua, Guatemala, approaches *C. aurata*, and I think Friese's insect should be reduced to subspecific rank.

The species now reported on may be separated thus:

Black species; very small.	<i>arizonensis vanduzeei</i> n. subsp.	1
Green species.		
1. Less than 5 mm. long; wings clear.	<i>nanula</i> Ckll.	2
Over 5 mm. long; wings fuliginous.		
2. Male, with trilobed light mark on face.	<i>melanoptera</i> n. sp.	
Female, with a broad elongate light mark on face.	<i>melanoptera</i> n. sp.	

MEGACHILIDÆ

MEGACHILE Latreille

(Leaf-cutting Bees)

In his reports on the bees of Lower California and adjacent regions, Mr. W. J. Fox included six named species (one as a *Lithurgus*), and three not definitely determined. Of the named ones we have in the present collection *M. longula* Fox, *M. occidentalis* Fox and *M. pollicaris* Say, the last represented by a race not then separated. The other three, *M. mexicana* Cresson, *M. exilis* Cresson, and *M. sayi* Cresson, were not obtained by Mr. Van Duzee. The two latter are well-known species of the United States. *M. mexicana*, described from a long series collected by Sumichrast in Mexico, has the ventral scopa of the female yellow, black on last segment; the male has dense yellow pubescence on the face, simple anterior tarsi, and anterior coxæ spined. Taking the combined lists, we have a small tropical element (*M. mexicana* and *M. poculifera*), and a series of species identical with or more or less related to those of the arid southwestern states. Thus the results are entirely parallel with those obtained from the study of the Anthophoridæ.

The species collected are readily separable by the following key:

Males.	1
Females.	10
1. Anterior tarsi simple.	2
Anterior tarsi modified.	6
2. Middle and hind femora mainly red; small species.	<i>lobatifrons</i> n. sp.
Middle and hind femora black.	3
3. Transverse keel of sixth abdominal segment contracted and narrowly emarginate.	<i>adelphodonta</i> n. sp.
Transverse keel of sixth abdominal segment broadly emarginate.	4

4. Transverse keel of sixth segment shallowly emarginate; small joints of tarsi red *frattii* (Ckll.)
 Transverse keel of sixth segment deeply emarginate; small joints of tarsi not red 5
5. Emargination of sixth segment much broader than long, its inner side nearly straight *frugalis* Cress.
 Emargination of sixth segment rounded, its inner side much curved *generosa* Cress.
6. Anterior tarsi not yellow *occidentalis* Fox.
 Anterior tarsi pale yellow 7
7. Middle (but not hind) femora clear red *pollicaris pereximia* (Ckll.)
 Middle femora black 8
8. First joint of anterior tarsi without a hollowed boat-like structure, all tarsi with last joint pale yellow *sidalcea* Ckll.
 First joint of anterior tarsi with a hollowed boat-like structure; middle and hind tarsi with last joint red or dark 9
9. Anterior femora black; anterior coxal spines very long *howardi* Ckll.
 Anterior femora at least largely pale; middle femora with a thorn-like tooth beneath *poculifera* Ckll.
10. Femora red; face and mandibles with immense processes *lobatifrons* n. sp.
 Femora not red 11
11. Mesothorax with two spots of white hair anteriorly; parallel-sided species, with clypeus modified 12
 Mesothorax with two lines of white hair anteriorly (if denuded, see next category); broad species with normal clypeus *vanduzeei* n. sp.
 Mesothorax without two spots or lines of white hair anteriorly 16
12. Snout-like excavation of clypeus without a projecting median lobe 13
 Clypeus with a median lobe or tubercle, and not snout-like 14
13. Upper part of clypeus showing a broad punctured surface, *longula* Fox
 Upper part of clypeus showing no such surface *discorhina* n. sp.
14. Clypeus with a median tubercle on disc *odontostoma* n. sp.
 Clypeus without such a tubercle 15
15. Median process of clypeus bifid; tegulae red *prosofidis* Ckll.
 Median process of clypeus entire; tegulae dark with red margin *prosofidis testudinis* n. var.
16. Hind tarsi bright chestnut red; clypeus short and broad *slevini* n. sp.
 Hind tarsi not red 17
17. Clypeus short and broad *frugalis* Cress.
 Clypeus of ordinary shape 18
18. Sixth abdominal segment abruptly descending, covered with coarse black hair *pollicaris pereximia* Ckll.
 Sixth abdominal segment not abruptly descending 19
19. Sixth abdominal segment pruinose with pale hairs, and without outstanding hairs *vanduzeei* n. sp.
 Sixth abdominal segment otherwise; if slightly pale-pruinose (*estebana*, *tiburonensis*), segment with outstanding hairs and an evident lip; size averaging smaller; ventral scopa white or (*estebana*, *tiburonensis*), faintly creamy, black on last segment 20
20. Vertex with white hair, and a little black behind ocelli; disc of thorax without dark hair; tegulae black; sixth dorsal segment with long black hairs, and slightly concave in lateral profile *sonorana* n. sp.
 Vertex with conspicuous black hair 21
21. Clypeus with no distinct smooth area; hair on its disc greyish brown; mesothorax excessively densely punctured; wings strongly dusky; sixth dorsal segment with black hair, and strongly concave in lateral profile *brachysoma* n. sp.
 Clypeus with a shining sparsely punctured space in middle; hair of clypeus long and pale, directed mesad; wings not so dark; scutellum with conspicuous dark hairs; sixth dorsal segment concave in lateral profile 22

22. Tegulae black; scutellum distinctly shining *estebana* n. sp.
 Tegulae red; scutellum entirely dull; black hair on scutellum shorter.
 *tiburoniensis* n. sp.

72. *Megachile lobatifrons*, new species

Belongs to the group in which anterior tarsi of male are simple, and their coxæ have dentiform projections, but no true spines.

♀. (Type). Length about 9.5 mm., of parallel-sided type, black, with clear pure white bands on thorax anteriorly (weakened in middle), hind border of mesothorax, behind scutellum, on hind margins of abdominal segments 1 to 4 (enlarged to triangular patches at sides of 1), and at base of segment 6; checks and sides of face with white hair; eyes dark brown; inner orbits parallel, facial quadrangle about square; mandibles broad and massive, quadridentate, base with a very large rounded lobe below, and a similarly large lobe, but angulate in front, above; clypeus deeply excavated, with a large projecting lobe at each side, and the projecting margin above presenting a pair of low rounded lobes; front polished but distinctly punctured, sculpture of vertex weak; scape black, flagellum dull red, dusky above; mesothorax closely punctured, but shining between the punctures; scutellum with punctures rather larger and sparser than on mesothorax; pleura and metathorax with much white hair; tegulae yellowish-ferruginous; wings clear, rather short, stigma ferruginous, nervures fuscous; basal nervure meeting nervulus; second cubital cell long, receiving recurrent nervures equally distant from base and apex; femora and tibiae bright chestnut red, but tarsi dark, hind basitarsi not enlarged; abdomen glistening, the first three segments closely punctured; ventral scopa white, black on last segment.

♂. Similar in appearance to the female; clypeus and mandibles ordinary; face densely covered with pure white hair; eyes slightly converging below; flagellum long, very obscure reddish; sixth abdominal segment with a narrow projecting bidentate process.

22 ♀, 3♂. Puerto Refugio, Angel de la Guarda Island, June 29, 1921 (Van Duzee). One female is marked as collected on Dalea. 1♂ Puerta Ballandra, Carmen I., May 22 (Van Duzee). A very neat little species, not closely related to any known to me. It will be easily known in the female by the structure of the face and mandibles, in the male by the end of the abdomen. The Carmen I. ♂ is hardly 7.5 mm. long.

Type: Female, No. 1512, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 29, 1921, at Puerto Refugio, Angel de la Guarda Island, Gulf of California.

73. *Megachile frugalis* Cresson

1♂. San Nicolas Bay, May 16; 3♀, Angeles Bay, June 25-26; 1♀ San Pedro Bay, July 7; 1♀, Bay South End of Tiburon Island, July 4; 1♀, Lagoon Cove, Angel de la Guarda I., May 2.

74. *Megachile pollicaris pereximia* Cockerell

1 ♂, San Marcos Island, May 12; 1 ♀ S. Nicolas Bay, May 16. The female was described as *M. vallorum* Cockerell. The male appears to differ from Say's type by the red middle legs, and is the western or desert form of the species. *M. pollicaris* male is easily known from *M. sayi* Cresson, by the yellow spines of anterior coxæ, as duly indicated by Say.

75. *Megachile (Chelostomoides) pratti* Cockerell

1 ♂. Guaymas, April 7. Described from Texas.

76. *Megachile generosa* Cresson

2 ♂. Angeles Bay, June 27.

77. *Megachile occidentalis* Fox

1 ♂. Tortuga Island, May 11. The female is known, but is not in the collection.

78. *Megachile sidalcea* Cockerell

4 ♂. Three from Guaymas, April 8, 11 and 15; one from Bay S. end of Tiburon Island, July 5. The female of *sidalcea* is known, but is not in the collection. *M. furcata* Vachal, from Chihuahua, is a synonym.

79. *Megachile howardi* Cockerell

2 ♂; one Guaymas, April 15; one Puerta Ballandra, May 22.

80. *Megachile poculifera* Cockerell

4 ♂. Guaymas, April 6 to 15. This species ranges into the tropics, and was recently taken by Dr. W. M. Wheeler on the Isthmus of Panama.

81. *Megachile longula* Fox

3 ♀. Agua Verde, May 28. 1 ♀ Mulegé May 14. 1 ♀ Angeles Bay, June 27. Originally described by Fox as *Lithurgus oblongus*, but the specific name then given had been used in *Megachile*. *Megachile chilopsidis* Cockerell is very closely allied, and perhaps only subspecifically distinct. The name *chilopsidis* was published in 1900, *longula* in 1902.

82. *Megachile adelphodonta* new species

Belongs to group with male anterior tarsi slender and simple, and coxæ without any trace of spines. Wings clear hyaline.

♂. Length 9 mm.; black, including tarsi, mandibles and antennæ, but tegulæ translucent, brownish, and hind tibial spurs white; hair of head and thorax white, abundant on cheeks, pleura, scutellum and metathorax, but not

hiding surface; face bare (probably denuded), except white hair at sides, and along lower margin of clypeus; head broad, facial quadrangle broader than long; eyes very dark; mandibles simple, not toothed below, cutting margin extremely oblique, with a short obtuse inner tooth; clypeus short and broad, the anterior margin depressed, and shallowly excavated, the disc finely punctured and shining; supraclypeal area more finely and closely punctured, with a slight median ridge; front closely punctured in middle, at sides shining and very delicately punctured; antennæ slender, simple; mesothorax and scutellum shining, with strong rather dense punctures; area of metathorax dull and finely granular, the margin slightly shining; legs simple, tarsi slender; claws bidentate apically, and with a strong, sharp inner tooth; abdomen stout, broad at base, strongly punctured, little hairy; narrow white sutural hair-bands, and hind margins of segments 2 to 4 pellucid pale brownish, broadening at sides; sixth segment retracted so as to be invisible from above, the transverse keel projecting, bidentate, with a narrow but deep emargination, the teeth short and obtuse, the margin laterad of them gently concave in outline.

1 ♂. Guadalupe Point, Concepcion Bay, Gulf of California, June 17 (E. P. Van Duzee). Related to the group of species which Robertson has segregated as *Chelostomoides*, but distinct, and easily recognized by the character of the end of the abdomen.

Type: Male No. 1513 Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 17, 1921 on Guadalupe Point, Concepcion Bay, Lower California.

83. *Megachile discorhina* new species

Belongs to group of comparatively narrow, parallel-sided species, with excavated clypeal region bounded by a rim, and long curved mandibles.

♀. Length 13 mm.; black, including legs, antennæ and mandibles, but tegulæ ferruginous, and spurs of hind legs curved and pale ferruginous; hair of head and thorax white, but thin dark fuscous hair on vertex, disc of mesothorax, and scutellum; sides of face with conspicuous white hair; head large, eyes diverging below; cheeks broad and rounded, obtusely angulate below; clypeus presenting a projecting sharp semicircular keel, obtusely lobulate laterally, and beneath this the broad concave surface smooth and shining, with a secondary excavation or large pit above; face of the very broad labrum also smooth and shining, continuous with the similar surface of clypeus; mandibles very long, curved, apically bidentate, the teeth far apart, and on inner side with a dentiform angle, the inner margin with long fulvous hairs; mesothorax and scutellum shining, with strong well-separated punctures; area of metathorax with a sericeous surface; a conspicuous spot of white pubescence mesad of each wing-base, and white hair in scutello-mesothoracic suture; wings hyaline, very faintly brownish, stigma and nervures piceous, recurrent nervures joining second cubital cell very near base and apex; legs simple, with white hair, hind basitarsi not broadened; abdomen punctured, with five narrow but very conspicuous white hair-bands; sixth segment descending, nearly vertical, with scanty black hair, last ventral projecting beyond it; ventral scopa clear white, brown at tip of last segment.

1 ♀. Palm Canon, Angel de la Guarda Island, Gulf of California, May 3 (Van Duzee). Resembles *M. longula* Fox, but upper part of clypeus without any broad punctured surface. The end of mandibles, with a single pair of widely separated teeth, at once separates it from *M. chilopsidis* Cockerell. The mesothorax of *chilopsidis* has in front a pair of very conspicuous marks

due to white hair; these are present in *discorhina*, but much smaller. The head of *chilopsidis* is much broader and more massive than that of *discorhina*. The venation of *chilopsidis* also differs, the first recurrent joining second cubital a considerable distance from base.

Type: Female, No. 1514, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 3, 1921, at **Palm Canyon, Angel de la Guarda Island, Gulf of California.**

84. *Megachile odontostoma* new species

♀. Length 11 mm.; narrow and parallel-sided; black, including legs and mandibles, but flagellum dull ferruginous beneath, tegulae reddish-brown with hyaline margins, spurs testaceous; head and thorax with thin white hair, long and dense at sides of face, on thorax forming two marks anteriorly, a band in scutello-mesothoracic suture, and a spot above each wing, these markings having a slightly yellowish tint; head oblong, eyes diverging below; facial quadrangle longer than broad; mandibles of the long and narrow type, with pale creamy hair on inner side, but no inner tooth, and oblique cutting margin without salient teeth; clypeus broad and low, with a median boss or tubercle, the anterior margin excavated in middle, and with a pair of forwardly directed spines, which are seen to project when the head is looked at from above; cheeks rounded, not angulate below; face and front very densely punctured, glistening between the punctures on supraclypeal area; vertex also very densely punctured, and with hardly any hair; mesothorax and scutellum strongly and closely punctured; wings hyaline, faintly brownish apically; stigma and nervures piceous; first recurrent nervure joining second cubital cell about twice as far from base as second from apex; legs simple, tarsi slightly reddened apically; hind basitarsi not broadened, or hardly so; abdomen parallel-sided, with four distinct narrow pure white hair-bands, and a fifth less distinct one; fifth and sixth segments with scanty short black hair; last dorsal as long as last ventral; ventral scopa entirely white.

1 ♀. Puerta Ballandra, Carmen Island, Gulf of California, May 22 (Van Duzee). A distinct species, without very near relatives, but in a general way allied to the group of *M. longula*, etc.

Type: Female, No. 1515, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 22, 1921, at **Puerta Ballandra, Carmen Island, Gulf of California.**

85. *Megachile prosopidis* Cockerell

1 ♀. Bay south end of Tiburon Island, July 5. Described from New Mexico.

86. *Megachile prosopidis* var. *testudinis*, new variety

♀. Differs by having median process of clypeus entire, more or less pointed; tegulae dark, with red margin. It represents perhaps a variation rather than a subspecies.

1 ♀. (Type), about 14 mm. long, Tortuga Island, Gulf of California, May 11 (Van Duzee). The other two females are smaller, hardly 12 mm.; one Angeles Bay, June 27; one Guaymas, April 8.

Type: Female, No. 1544, Mus. Calif. Acad. Sci., collected May 11, 1921, by E. P. Van Duzee, on Tortuga Island, Gulf of California.

87. *Megachile slevini*, new species

♀. Length about 13.5 mm.; robust, but abdomen not of the triangular type; black, including mandibles, antennæ and tegulæ, but tarsi chestnut red (anterior basitarsi blackened), and a little red on tibiæ at apex; spurs red; hair of head and thorax long and white, but pale red hair on vertex, long red hair from beneath margin of clypeus, red hair on under side of mandibles, and long bright ferruginous hair at apex of labrum; head large and broad, facial quadrangle somewhat broader than long; sides of face with long white hair, that between antennæ slightly reddish; mandibles broad and massive, with three strong teeth not counting inner corner; clypeus short and broad, margin concave on each side of the obtusely projecting middle; head and thorax very finely rugoso punctate; no patches or bands of white hair on thorax above; wings dusky, stigma bright ferruginous, nervures piceous, the basal nervure red, and the membrane basad of it broadly suffused with red; second cubital cell receiving first recurrent nervure nearer base than second to apex; tarsi with orange-red hair; hind basitarsi not much broadened; abdomen with conspicuous white hair-bands on apices of segments 2 to 5, the thin discal hair on segments 4 and 5 red, on 6 brownish; sixth segment descending, but with abrupt outwardly directed lip, which is not surpassed by the last ventral; ventral scopa entirely white.

1 ♀. Gonzales Bay, Lower California, April 29 (Van Duzee). I have taken the liberty of naming this distinct species after the leader of the expedition. It resembles *M. pollicaris pereximia*, but is easily distinguished by the color of tarsi, scopa, etc.

Type: Female, No. 1516, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 29, 1921, at Gonzales Bay, Lower California.

88. *Megachile vanduzeei*, new species

♀. Short and broad, with narrow clear white bands on abdomen; ventral scopa long, silky and white, black on last segment; flagellum variably red beneath; mesothorax in front with a pair of lines due to hair, but these are slender and weak and often abraded and lost; a white band in scutello-mesothoracic suture, also sometimes abraded; vertex with black or brown hair. I had at first taken this for *M. newelli* Cockerell, the type of which is from Louisiana, but although the resemblance is very close, it is certainly distinct, *newelli* having much broader hind basitarsi, with the anterior side strongly convex. The middle tarsi are however, of the *newelli* type, as is the straight profile (in lateral view) of the sixth abdominal segment. The lower margin of the clypeus is straight, with a shining edge; in *newelli* it is distinctly concave or arched, with practically no shining edge. Although the punctures of mesothorax are very fine, they are quite distinct under a lens, on a slightly shining surface, while in *newelli* the whole mesothorax is dull, and a lens will hardly resolve the punctures. *M. kallstræmia* Cockerell, which also has the straight profile of sixth segment, has the hind basitarsus very broad in the fashion of *newelli*, but is easily known by the anterior margin of mesothorax broadly covered with white hair except in the middle. *M. townsendiana* Cockerell has the ventral scopa

entirely white, and the sixth segment concave in profile. *M. cleomis* Cockerell and *M. lippia* Cockerell, which are exceedingly like our species in appearance, have the sixth segment concave in profile, and the ventral scopa yellowish, black on last segment. When the abdomen is looked at from the side, the white bands are seen to be conspicuously overlapped by black hairs in *cleomis*, but this is not the case with *lippia*, nor with the species now described. The type of *M. vanduzeei*, from Guaymas, is about 12 mm. long; others are smaller, one (also from Guaymas) being only 10 mm.

3 ♀. Guaymas, Mexico, April 8; two ♀, bay south end of Tiburon Island, July 5; one ♀, San Francisquito Bay, June 23. All collected by Mr. E. P. Van Duzee. The sixth dorsal segment does show a very slight concavity in profile just before the apex, but has nothing of the distinct lip and median concavity of the *M. brevis* group. It also lacks the outstanding hairs of that group.

The remaining four species have exactly the aspect of the common *M. brevis* Say, of the Eastern States, but are separable by readily appreciable characters.

Type: Female, No. 1517, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 8, 1921, at Guaymas, Sonora, Mexico.

89. *Megachile sonorana*, new species

♀. Length about 10 mm.; black with long-cordiform abdomen; pubescence white, short and scanty on mesothorax, black behind ocelli but white on occiput; ventral scopa pure white, black on last segment and sides of the one before; no white hair marks on mesothorax anteriorly, but a white band in scutello-mesothoracic suture, and also above tegulae; mandibles broad, quadridentate, strongly convex on outer side; front and sides of face with much white hair, but clypeus thinly haired, appearing bare seen from in front; clypeus densely and minutely punctured at sides, in middle shining, with coarser punctures in oblique lines, but no impunctate space; lower margin of clypeus straight; supraclypeal area with a smooth shining space; antennae entirely black; mesothorax and scutellum finely and closely punctured; sides of metathorax, below enclosure, shining with a silky lustre; tegulae black, with a spot of white hair in front; wings hyaline, slightly dusky; stigma dusky ferruginous, nervures fuscous; second cubital cell receiving second recurrent nervure nearer apex than first from base; legs black, hind spurs creamy-white, tipped with brown; hair on inner side of tarsi pale red; hind basitarsi broad, but anterior margin only gently convex; first five abdominal segments with narrow pure white apical hair-bands; sixth segment gently concave in lateral profile with outstanding black hairs on basal half.

1 ♀. Guaymas, Mexico, April 8 (Van Duzee). The venation and other characters negative the idea that this can be the female of *M. onobrychidis* Cockerell, described from New Mexico. The last abdominal segment and other characters separate it from *M. petulans* Cresson. In the key above, *M. petulans* would run out at *M. estebana*, from which it is easily known by the last dorsal segment.

Type: Female, No. 1518, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 8, 1921, at Guaymas, Sonora, Mexico.

90. *Megachile brachysoma*, new species

♀. Length about 10 mm.; black with mainly white pubescence, but pale brownish on disc of clypeus, coarse and black on vertex, thin, short and white on mesothorax and scutellum, with a very little, hardly visible dark hair on disc of mesothorax; ventral scopa white, black on last segment; hair on inner side of tarsi fulvous. This is the species which most resembles *M. brevis*, from which it is readily known by the dense tuft of pure white hair behind base of wings, the darker wings and dark stigma, and black hair on last ventral segment, but it is perhaps no more than a western subspecies of *brevis*. The clypeus is strongly and densely punctured, and its lower margin is slightly undulate. The antennæ are entirely black; the tegulæ dark, but reddish in middle, and the outer margin pallid. The second cubital cell receives the second recurrent a trifle nearer its apex than first to base; the veins are much heavier and darker than in *brevis*. The hind spurs are pale ferruginous.

1 ♀. San Francisquito Bay, Gulf of California, May 10 (Van Duzee). The darker wings and the venation separate this from *M. ferbrevis* Cresson.

Type: Female, No. 1519, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 10, 1921, at San Francisquito Bay, Gulf of California.

91. *Megachile estebana*, new species

♀. Length nearly 11 mm.; black, with white hair, the ventral scopa faintly creamy, black on last segment except basally; vertex with coarse black hair; mesothorax and scutellum with black hairs on disc; abdomen with conspicuous white bands on hind margins of segments 2 to 5, but that on first not distinctly defined; clypeus and supraclypeal area each with a shining median space or line. I had at first taken this for a small example of *M. lippia* Cockerell, especially on account of the perceptible yellowish tint of the ventral scopa but it is certainly distinct by the smaller and more slender basitarsi; the black tegulæ, the black hair at sides of abdominal segments 5 and 6, so reduced as to be inconspicuous, and the entirely black antennæ. Nevertheless, additional material may reduce it to a subspecies of *M. lippia*.

1 ♀. San Esteban Island, Gulf of California, April 19 (Van Duzee).

Type: Female, No. 1520, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 19, 1921, on San Esteban Island, Gulf of California.

92. *Megachile tiburonensis*, new species

♀. Length about 11 mm.; similar to *M. estebana*, but tegulæ red, scutellum dull, and black hair at sides of fifth abdominal segment long and conspicuous. Ventral scopa slightly creamy, black on last segment. This is another insular derivative of *M. lippia*, and could be treated as a subspecies. The antennæ are entirely black, and the first recurrent nervure joins the second cubital cell much nearer the base than in *lippia*. There is a slight elevation in the middle of the occipital margin.

1 ♀. Bay S. end of Tiburon I., Gulf of California, July 4 (Van Duzee).

Type: Female, No. 1521, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, July 4, 1921, at Bay, south end of Tiburon Island, Gulf of California.

There are two forms which might be confused with one or more of the above, namely:

(1). *M. nupta* Cresson. Messrs. H. Skinner and E. T. Cresson, Jr., kindly examined Cresson's type, and reported ventral scopa entirely pale. It is really very light yellow, and a cotype showed fuscous hairs at extreme sides of last ventral segment. The eyes were dark brown, and the middle of mesothorax dull between the punctures. I noted from the cotype that it was in all respects very close to *M. brevis*, but distinguished by absence of black hair on vertex and mesothorax. The last dorsal segment has erect black hair, but apically has appressed light hair. What I called *M. nupta*, var. a., is certainly another species.

(2). *M. murinella* Cockerell. I have regarded this as a race of *M. brevis*. In the above table it runs to *M. brachysoma*, but the wings are not so dark and the venation is more delicate, the last dorsal segment is practically straight in profile, and the mesothorax is glistering anteriorly. This is evidently to be separated both from *brevis* and *brachysoma*.

ASHMEADIELLA Cockerell, 1897

Ashmeadiella is a North American genus of small or smallish bees, especially abundant in the southwest. The species are often closely allied, and it is probable that a thorough revision based on abundant material would show many more species than at present recognized. The forms in the present collection may be separated as follows:

At least middle and hind femora red.....	1
Femora black.....	3
1. Males; apex of abdomen quadridentate.....	<i>rufipes</i> Titus
Females, with white ventral scopa.....	2
2. Anterior femora black, or slightly brownish or reddish.....	<i>rufipes</i> Titus
Anterior femora bright red, with a black streak beneath at base.....	<i>haematopoda</i> n. sp.
3. Males; apex of abdomen quadridentate.....	4
Females, with white ventral scopa.....	7
4. Very minute, length 4 mm. or less; stipites with long hairs.....	5
Larger, at least 5 mm.....	6
5. Apical teeth of abdomen clear red.....	<i>schwarzi</i> Titus
Apical teeth of abdomen dark brown; smallest species, about 3 mm. long.....	<i>microsoma</i> n. sp.
6. Apical teeth of abdomen pallid, short and broad.....	<i>leucozona</i> n. sp.
Apical teeth of abdomen dark brown, long and narrow.....	<i>digiticauda</i> n. sp.
7. Very small, considerably less than 5 mm. long; tegulae dark brown.....	<i>schwarzi</i> Titus
Larger, at least 5 mm. long.....	8
8. Tegulae clear reddish; comparatively large form, 6 or 7 mm. long.....	9
Tegulae dark brown or black.....	10
9. Sixth abdominal segment densely covered with white hair; mandibles red.....	<i>rhodognatha</i> n. sp.
Sixth abdominal segment thinly covered with white hair; mandibles not red.....	<i>leucozona</i> n. sp.
10. Small species, less than 6 mm. long; raised part of second abdominal segment dullish, with excessively close minute punctures; mesothorax very finely and closely punctured.....	<i>echinoceci</i> Ckll.

- Raised part of second abdominal segment shining, with distinctly separate punctures 11
11. Smaller; abdomen narrow *subangusta* n. sp.
- Larger; abdomen broad *crassa* n. sp.

93. *Ashmeadiella rufipes* Titus, 1904

Described from San Diego County, California.

Angeles Bay, June 26-27, 4 ♀; Gonzales Bay, April 29, 2 ♀; Puerto Refugio, Angel de la Guarda Island, June 29, 1 ♀; Monserrate Island, June 13, 1 ♂; Coronado Island, Gulf of California, May 18, 1 ♂. In the females the hind tarsi vary from practically all black to nearly all red, and the tegulæ from dark to red. These differences are not correlated with different localities.

94. *Ashmeadiella schwarzi* Titus, 1904

Described from Arizona; our females are smaller than the type.

Guaymas, April 6, 1 ♂, April 8 and 10, 2 ♀.

95. *Ashmeadiella echinocerei* Cockerell, 1911

Described from Flagstaff, Arizona.

Puerto Refugio, Angel de la Guarda Island, May 1, 2 ♀. I at first thought that *A. digiticauda* might be the male, but the pubescence is differently colored, and on close comparison I feel sure they are distinct.

96. *Ashmeadiella hæmatopoda*, new species

♀. Length about 5 mm.; black, with entirely white hair, dense on sides of face, very long on scutellum, on abdomen forming narrow white bands, sixth segment thinly pubescent; hind margins of first four abdominal segments narrowly rufous; apical part of mandibles clear red, except black tip; flagellum ferruginous beneath; tegulæ dilute reddish; wings clear, nervures dark, pale reddish at base of wing; legs shining bright ferruginous, the anterior pair dark at base, and with a black stripe on their femora behind basally; eyes pale green; facial quadrangle much longer than broad; clypeus convex, very finely and closely punctured; mesothorax and scutellum shining, the punctures rather widely separated; abdomen shining, finely punctured, basin of first segment large.

Tiburon Island, taken at Freshwater Bay, April 23, 1 ♀ (Van Duzee). Resembles *A. rufipes*, but easily distinguished as shown in the key.

Type: Female, No. 1522, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 23, 1921, at Freshwater Bay, Tiburon Island, Gulf of California.

97. *Ashmeadiella microsoma*, new species

♂. Length about 3 mm.; black, with entirely white pubescence, dense on face and front, very long on scutellum; head large, circular; eyes dark; mandibles red subapically; front rough but shining on each side of median ocellus; flagellum obscurely reddish beneath; mesothorax shining; but with strong punctures, its front and sides with moss-like white hairs; tegulae brown; wings clear, second cubital cell higher and shorter than usual, with end of first recurrent distant from its base not much more than equal to half length of first intercubitus; small joints of tarsi brownish; abdomen with the usual white bands; apical teeth dark reddish brown, short, the median ones not much longer than broad; genitalia of the type usual in the genus, but stipites acutely pointed, instead of obtuse at tip as in *A. meliloti* Ckll.

Guaymas, Mexico, April 6, 1 ♂ (Van Duzee).

Type: Male, No. 1523, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 6, 1921, at Guaymas, Sonora, Mexico.

98. *Ashmeadiella leucozona*, new species

♂ (Type). Length about 6 mm.; black, the abundant pubescence entirely pure white, dense on face, front and cheeks, forming a broad gently curved band across mesothorax anteriorly, long on scutellum, long and dense along margins of mesopleura, forming a dense fringe along hind margins of trochanters and femora, a dense broad band on hind tibiae posteriorly, and rather broad bands on abdomen, that on first expanding at sides into large triangular patches; mandibles reddened subapically; flagellum slender, dull ferruginous beneath; front coarsely punctured, but vertex shining, with punctures more separate; mesothorax highly polished, with well separated punctures; scutellum roughened with punctures, but shining; tegulae rufous; wings hyaline, with dark nervures, second cubital cell long; small joints of tarsi bright ferruginous; abdomen rather closely and finely punctured, apical teeth testaceous, short, the median ones very broad and truncate, more than twice as broad as long.

♀. Length about 7 mm.; similar to the male, except for the usual sexual characters; hair of clypeus long, but not altogether hiding the roughened surface; lower margin of clypeus undulate; mandibles black; flagellum dusky reddish beneath; hair of scutellum faintly tinged with yellowish; abdominal bands delicately suffused with yellowish; sixth segment thinly pubescent; ventral scopa white. The hair on inner side of hind tarsi is pale orange. Eyes olive green.

Guaymas, Mexico, April 10, 3 ♂, 2 ♀ (Van Duzee). The female is separated from *A. meliloti* especially by the transverse band of white hair on mesothorax anteriorly. One specimen (male, variety a) has the median apical teeth of abdomen considerably narrower, but appears to belong to the same species.

Type: Male, No. 1524, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 10, 1921, at Guaymas, Sonora, Mexico.

99. *Ashmeadiella digiticauda*, new species

♂. Length about 5 mm.; black, with mainly white pubescence, but on vertex and dorsum of thorax it is pale yellowish, and the abdominal bands have a slightly yellowish tint; clypeus not so densely covered as to hide the disc, which has very coarse punctures placed as closely as possible; mesothorax with no band of hair or spots anteriorly; head moderate; eyes black; mandibles reddish apically; flagellum obscure reddish beneath; region on each side of ocelli very densely punctured, not polished; mesothorax dull and very closely punctured; tegulae dark; wings greyish; legs black, tarsi a little reddish apically; abdomen closely punctured; apical teeth dark, the lateral ones red on inner side, the middle ones long and narrow, like the end of a finger, and copiously hairy.

Tortuga Island, Gulf of California, May 11 (J. C. Chamberlin). A distinct species, especially known by the apical teeth of abdomen. *A. californica* Ashmead runs to the same place in the table, but differs by the much more shining abdomen, even longer median apical teeth of abdomen, and green eyes. *A. aridula* Cockerell and *A. wislizeni* Cockerell are somewhat allied, but easily distinguished by the pure white hair on thorax above. *A. digiticauda* differs at once from *A. cactorum* Cockerell by the color of pubescence and densely punctured mesothorax.

A. prosopidis Cockerell runs out of the table because of the very small size, pale tegulae and highly polished second abdominal segment.

Type: Male, No. 1525, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 11, 1921, on Tortuga Island, Gulf of California.

100. *Ashmeadiella rhodognatha*, new species

♀. Length about 6 mm., robust, with broad face; black, the pubescence entirely white, except that it is pale yellow on inner side of tarsi; it is dense on cheeks and sides of face, forms a transverse patch (not sharply defined) on mesothorax anteriorly, dense along hind margin of mesothorax, very dense and white on hind tibiae posteriorly, and forming the usual abdominal bands, the sixth segment densely covered; hind margins of first four abdominal segments reddened. Clypeus closely punctured but shining, concave before apex; mandibles broad, chestnut red, the teeth black; flagellum short, rather obscure red beneath, except at base; front dull and very densely punctured, vertex closely punctured, but glistening; eyes dark greyish; mesothorax highly polished, with very distinct but well separated punctures; area of metathorax smooth and polished; tegulae clear bright ferruginous; wings clear, with dark nervures; first recurrent at least twice as far from base of second cubital cell as second from apex; legs black, with abundant white hair; abdomen shining, finely punctured, basin of first segment large.

San José Island, Gulf of California, May 28 (Van Duzee).

1 ♀. Easily known by the red mandibles and other characters.

Type: Female, No. 1526, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 28, 1921, on San José Island, Gulf of California.

101. *Ashmeadiella subangusta*, new species

♀. Length nearly 6 mm.; black, slender, the pubescence entirely white, except slightly yellowish on inner side of tarsi; face rather narrow, with dense white hair at sides; eyes green, blackish anteriorly; clypeus extremely densely punctured; mandibles obscurely rufescent apically; flagellum slightly reddened beneath; vertex with large strong punctures, but the intervals shining; mesothorax strongly convex, shining, strongly punctured, without spots or band of hair in front; mesopleura closely punctured; tegulae brown; wings hyaline, with dark nervures, second cubital cell much shorter than in *A. crassa*; legs not very hairy; abdomen remarkably narrow for the genus, but basin of first segment sharply defined; white hair-band slender, distinct only on first four segments; sixth segment sparsely hairy; punctures of abdomen fine, on a shining surface; ventral scopa pure white, rather thin.

Guaymas, Mexico, April 8 (Van Duzee). Recognizable by the peculiar slender form.

Type: Female, No. 1527, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 8, 1921, at Guaymas, Sonora, Mexico.

102. *Ashmeadiella crassa*, new species

♀. Length about 6.6 mm., robust; black, with white pubescence, tinged with ochreous on scutellum, the abdominal bands slightly yellowish, hair on inner side of tarsi orange; head large, but facial quadrangle considerably longer than broad; sides of face with dense white hair; clypeus very densely punctured, the lower margin not crenulate or undulate, but very broadly shallowly excavated, concave; mandibles black; eyes green, blackish in front; flagellum very obscurely brown beneath; vertex closely punctured; mesothorax rather dull, very closely and finely punctured, in front with thin erect hair, in the type forming a pair of distinct spots, lacking in the Puerto Refugio specimen; posterior margin of mesothorax with dull white hair, contrasting with the yellowish of scutellum; mesopleura densely rugosopunctate; tegulae black (dark reddish in Puerto Refugio specimen); wings hyaline, with dark nervures; legs black; abdomen broad, shining but well punctured, sixth segment thinly hairy; ventral scopa white.

Type (1 ♀) from San Francisquito Bay, Gulf of California, May 10 (Van Duzee). One ♀ from Puerto Refugio, Angel de la Guarda Island, May 1 (Van Duzee). Related to *A. coquilletti*, Titus, but mandibles with no red band, tegulae with no red spot, and ventral scopa white. The clypeal structure also differs.

Type: Female, No. 1528, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 10, 1921, at San Francisquito Bay, Lower California.

COELIOXYS Latreille

The species in the collection are separable thus:

First three abdominal segments red	.....	<i>menthæ</i> Ckll.	
At least second and third segments black; females	.....		1
1. Last ventral segment very broadly rounded at end, with hairy margin	.....	<i>tiburonensis</i> n. sp.	
Last ventral segment otherwise	.....		2
2. Scutellum partly red, and with a strong median projection	.....	
.....	.....	<i>gonaspis</i> n. sp.	
Scutellum entirely black, with no median projection	.....	<i>novomexicana</i> Ckll.	

These bees are parasitic in nests of *Megachile*.

103. *Coelioxys menthæ* Cockerell

Guaymas, Mexico, 2 ♂, April 7 (Van Duzee). This species has been known from females collected in Arizona and southern New Mexico. The present males agree well, except for the straight and black axillar spines. I do not believe they can belong to a different species, and the scutellum shows that they are not *C. slossoni* Viereck. The last segment has four apical spines (no median one), the lower very slender and sharp; the basal lateral spines are long and slender.

104. *Coelioxys novomexicana* Cockerell

San Francisquito Bay, Gulf of California, June 23 (Van Duzee). 1 ♀. Known from Arizona and southern New Mexico.

105. *Coelioxys tiburonensis*, new species

♀. Length a little over 9 mm., rather slender; black, with the mandibles (but teeth black), scape, large patch at each side of mesothorax in front, ends of axillar spines, apical middle of scutellum, sides of first abdominal segment broadly, extreme sides of segments 2 to 4, and venter suffusedly, all dark red; tegulae and legs bright ferruginous; clypeus ordinary; face and sides of front covered with white hair; cheeks with white hair, the broad depression hairy; third antennal joint about as long as fourth, but more slender; mesothorax and scutellum closely and very coarsely punctured, but the intervals shining; anterior margin of mesothorax with a band of dull white hair, but no hair-spots here or on scutellum; tubercles reddish at end; hind margin of scutellum broadly subangulate, with a small median tubercle, but no median keel; axillar spines long, sharp and straight; postscutellum with dense white hair in middle; truncation of metathorax dull; wings strongly dusky in marginal cell and on apical margin; first recurrent nervure joining second cubital cell well beyond base; spurs red; abdomen highly polished, with small sparse punctures, evanescent on segments 5 and 6; six narrow white hair-bands, the first bounding basin of first segment; last dorsal obtuse, shorter than last ventral (but not greatly so), apically covered with dark chocolate-colored hair; last ventral, very broad, angularly subtruncate, with a sharp black median spine,

almost concealed by the dense fringe of black hair, which it does not surpass; fourth and fifth ventral with smaller and closer punctures than second and third. Hair of eyes short.

Bay south end of Tiburon Island, July 4 (Van Duzee). 1 ♀.

In my table and that of Crawford this runs to *C. texana* Cresson, but it is really quite distinct, and the scutellum shows that it cannot be the female of *C. texana sonorensis* Cockerell. It is actually nearer to *C. sanguinicollis* Friese, which occurs from Orizaba, Mexico, to Paraguay, but is readily separated by the color of the thorax and the white abdominal bands.

Type: Female, No. 1529, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, July 4, 1921, at Bay at south end of Tiburon Island, Gulf of California.

106. *Coelioxys gonaspis*, new species

♀. Length about 11.5 mm.; black, with the following parts red, greater part of mandibles, obscure patch on upper part of mesopleura, axilla, apical middle of scutellum broadly, first abdominal segment (except lower part of basin), extreme sides of second segment, and venter except last segment; tegulae bright ferruginous; legs bright red, the hind tibiae (except in front) and tarsi black; hair of eyes short; face covered with ochreous-tinted hair; antennae black, third joint shorter than fourth; cheeks hairy, including the depression; tubercles reddened, seen from in front pointed, thorn-like; mesothorax and scutellum closely and very coarsely punctured, without distinct hair-spots; axillar spines long and pointed, slightly curved; hind margin of scutellum with a salient tubercle, pyramidal in outline; metathorax with much white hair, but the area bare and entirely dull; disc of mesopleura thinly hairy; wings dusky in marginal cell and along apical margin; first recurrent nervure joining second cubital cell well beyond base; tarsi with golden hair on inner side; spurs red; abdomen conical, broad at base, shining, with sparse punctures, stronger and closer on basal part, but on sixth segment minute and very much closer than on fifth; hair-bands tinged with ochreous; last dorsal segment produced, not very abruptly narrowed, apically keeled; sixth ventral extending beyond dorsal, but not very greatly so, its apical part parallel-sided, not notched, broadly rounded, with a small median point; third and fourth ventral segments punctured nearly alike, fifth more closely. Neither in this species nor *C. tiburonensis*, is the sixth dorsal turned up at end, or the sixth ventral curved downward.

Guadalupe Point, Concepcion Bay, Gulf of California, June 17 (Van Duzee). 1 ♀. In my table this runs out near *C. zapoteca* Cresson; in Crawford's to *C. sculptifrons* Crawford, a species from New York which is not allied. The last ventral segment is not unlike that of the South American *C. levis* Friese, but in other respects the bees are quite different.

Type: Female, No. 1530, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 17, 1921, at Guadalupe Point, Concepcion Bay, Lower California.



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XXVIII

EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921*

THE SPIDER FAUNA OF THE SHORES AND
ISLANDS OF THE GULF OF CALIFORNIA

BY

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Heretofore no spiders have been recorded from the islands of the Gulf of California. Consequently, it is a matter of interest to be able to present a report on a large collection secured upon these islands and the adjacent coast by the expedition of the California Academy of Sciences which operated in that region from April to July, 1921. This collection contains representatives of more than 180 species. Although obviously not exhaustive, it furnishes, in conjunction with the records of Simon¹ and Banks² for the Lower Californian peninsula, a substantial basis for a study of the spider fauna of this region which will indicate general characteristics and relationships, and will reveal the special problems to which future field work upon the group should be directed.

*A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

¹ E. Simon, Sur les Arachnides recueillis en Basse Californie par M. Diguët. Bull. Museum d'hist. Nat., 1895, pp. 105-107.

² E. Simon, Descriptions de quelques arachnides de Basse Californie faisant partie des collections du Dr. Geo. Marx. Bull. Soc. Zool. France, Vol. XX, 1895, pp. 134-137.

³ N. Banks, Arachnida from Lower California and other parts of Mexico. Proc. Calif. Acad. Sc., 3 ser., Vol. I, pp. 205-308, pl. xii-xvii, 1898.

April 14, 1924

The spider fauna of the Gulf of California region is complex, and is undoubtedly diverse in origin both as to the time and sources of derivation of its various groups and elements. This large group presents not one, but many problems of origin and distribution; for the adequate solution of these problems extensive and accurate work must be done on the arachnids of various other regions. This fauna, in the main, has been long established, as indicated by the large percentage of forms peculiar to the area, or extending but little beyond it, nearly two thirds of the known species and many genera falling in this category. The section seems to have been the center of origin for, or the highway for, various forms that have penetrated into the southwestern United States. The reverse movement of peculiarly North American forms has apparently been much more restricted, and one gets the impression from the affinities of the indigenous species and genera that so far as the more primitive and peculiar spider fauna is concerned, the Gulf of California area is tropical, an extension, as it were, of South America.

Along with indigenous species of familiar tropical genera such as *Selenops* and *Olios*, there are among the forms that appear to be most abundant in the area various species widespread in tropical America. The following species occur commonly in Mexico, Central America, the West Indies, parts of the southern United States, and to some extent also in the northern section of South America:

Scytodes fusca Walckenaer; *Physocyclus globosus* (Taczanowski); *Eustala anastera* (Walckenaer); *Neoscona oaxacensis* (Cambridge); *Cyclosa walckenaeri* (Cambridge); *Larinia directa* (Hentz); *Gea heptagon* (Hentz); *Selenops aissus* Walckenaer; *Ctenus hibernalis* Hentz; *Misumenops celer* (Hentz); *Peucetia viridans* (Hentz); *Thiodina sylvana* (Hentz).

In connection with these species may be mentioned *Thanatus rubicundus* Keyserling, and *Hamataliva grisea* Keyserling, common in the southeastern United States but found also in the West Indies and ranging into northwestern Mexico.

The forms listed below occur over the range represented for the preceding group but extend beyond also over the more southern parts of South America:

Filistata hibernalis Hentz; *Artema atlanta* Walckenaer; *Psilochorus pullulus* (Hentz); *Theridion fordum* Keyserling; *Theridion studiosum* Hentz; *Argiope argentata* (Fabricius); *Gasteracantha cancriformis* (Linnaeus).

Metepeira labyrinthea (Hentz) occurs from Labrador to Patagonia. *Heteropoda venatoria*, recorded from the cape region of Lower California, is tropicopolitan.

The following species occur in the cape region of Lower California (fide Banks, op. cit.), but, excepting in the case of *Araneus detrimentosus* and *Cyclosa bifurca*, are not represented in the present collection. These species are known otherwise to be found only in Mexico or Mexico and Central America excepting *Cyclosa fusiformis* which has been taken as far south as Peru:

Pacylomerus pustulosus Becker; *Eutyichides dugesii* Simon; *Evagrus mexicanus* Ausserer; *Araneus bivariolatus* (Cambridge); *Araneus detrimentosus* (Cambridge); *Cyclosa bifurca* (McCook); *Cyclosa fusiformis* (Taczanowski); *Misumenops dubius* (Keyserling).

The record for *Evagrus mexicanus* may be based upon a specimen of the species here described as new under the name *Evagrus empiricus*. Simon also lists *Evagrus mexicanus* for Lower California but does not indicate the particular locality.

There is a large group of species occurring in the Gulf of California region which range otherwise up the Pacific Coast or over some part of the southwestern area of the United States. The actual areas and centers of distribution of these species vary greatly, however. Some of the forms have very limited known distributions, as in the cases of *Phidippus arizonensis* and *Phidippus mexicanus* known in the United States only from Arizona, and those of *Tmarus magniceps* and *Herpyllus validus*, occurring outside of the present region only in southern California and southwestern Arizona. On the other hand, *Marpissa californica*, for example, is found over a wide area in the southwestern United States and southward as far as Guatemala:

Eurypelma rusticum Simon; *Eurypelma steindachneri* Ausserer; *Diguetia canities* (McCook); *Psilochorus utahensis* Chamberlin; *Megamyrmeleon cali-*

fornicum Simon; *Herpyllus validus* (Banks); *Lithyphantes pulcher* Keyserling; *Lithyphantes fulvus*; *Araneus gemmus* (McCook); *Eurobia californica* Banks; *Mimetus hesperus* Chamberlin; *Tmarus magniceps* Keyserling; *Xysticus discursans* Keyserling; *Olios fasciculatus* Simon; *Anachemmis sober* Chamberlin; *Pardosa sternalis* (Thorell); *Icius vitis* (Cockerell); *Marfissa californica* (Peckham); *Phidippus formosus* (Peckham); *Phidippus johnsonii* (Peckham); *Phidippus mexicanus* Peckham; *Phidippus arizonensis* (Peckham); *Dendryphantes imperialis* (Peckham); *Dendryphantes limbatus* (Banks); *Pellenes delectus* Peckham; *Pellenes dolosus* Peckham; *Pellenes elegans* Peckham; *Pellenes hirsutus* (Peckham); *Pellenes tranquillus* Peckham.

Theridion tepidariorum, *Metargiope trifasciata*, and *Menerus bivittatus* are cosmopolitan species, while *Loxosceles rufescens*, *Salticus scenicus*, *Scytodes thoracica* and *Misumena vatia* occur in the northern hemisphere in both the Old and the New World.

Of the more northern species such as occur in Canada and the northeastern United States a considerable number have found their way down the mountains in Mexico to such places as Tepic which have not been taken in Lower California or the islands of the Gulf. Of the species in this group the author finds in the present collection representatives of only *Dictyna volucripes*, *Agelena naevia*, *Cyclosa turbinata* and *Ariadna bicolor*. The other species in the list below are given on the authority of Simon, who unfortunately does not mention any specific localities, and Banks, whose specimens for the most part were from the cape region of Lower California. Some of these records are probably based upon misidentifications and require confirmation. The records for *Phidippus audax* (*P. morsitans*), listed by Simon, and for *Theridion rupicola* and *Dictyna sublata*, listed by Banks are to be questioned. The form from the cape given as *Linyphia phrygiana* is quite likely *Linyphia hespera* Chamberlin, which replaces the former species in the southwestern States:

Dictyna sublata (Hentz); *Dictyna volucripes* Keyserling; *Ariadna bicolor* (Hentz); *Theridion rupicola* Emerton; *Euryopis funebris* (Hentz); *Linyphia communis* Hentz; *Linyphia phrygiana* C. Koch; *Tetragnatha elongata* Walckenaer; *Cyclosa turbinata* (Walckenaer); *Mangora placida* (Hentz); *Mangora gibberosa* (Hentz); *Xysticus luctans* (C. Koch); *Misumenops asperatus* (Hentz); *Agelena naevia* Walckenaer; *Arctosa littoralis* (Hentz); *Lycosa carolinensis* Walckenaer.

In considering the forms that appear to be strictly peculiar to Lower California and the islands of the Gulf of California or ranging but a limited distance into adjacent territory, one notes that while some of these species belong to widespread genera such as *Oxyopes*, *Oxyopeidon*, *Olios* and *Selenops*, which are tropicopolitan, many other species belong to genera peculiar to the tropical region of America. Such a genus, for example is *Evagrus* which has heretofore been represented by one known species in Colombia, two in Central America and Mexico, and one in the United States. To this genus the present paper adds four new species from the Gulf of California area. Other genera in this category are *Eutychides*, occurring in California, Mexico and the West Indies, *Zorocrates*, otherwise known only from Central America, *Pocobletus*, known elsewhere from Venezuela, *Scaphiella*, found also in Venezuela and the West Indies, *Sosippus*, represented also in Central America, Mexico, Florida and California, *Nops*, occurring in the West Indies, across the northern section of South America and in Peru and Ecuador, and the atid genera *Hamataliva*, *Wala*, and *Sassacus*.

Of these genera *Nops* belongs to the small and highly interesting family *Caponiidæ*. This family is represented in South Africa by a single species, which is unique in the genus *Caponia*, being otherwise confined to America where it is represented by a considerable number of species in South America, Central America and the West Indies, these species forming two genera. The African species possesses eight eyes while the American species heretofore recorded have only two eyes, a unique condition among the *Araneina*. One of the American genera, *Nops*, occurs in Lower California and along with it in this territory and the islands of the Gulf representatives of three other genera herein described for the first time. In one of these genera four eyes are present, representing in this respect a transitional condition. The indication given by the occurrence in this region of four genera of *Caponiidæ* represented by seven species now known is of obvious relationship to the South American fauna at a probably remote date.

Among the spiders most abundant on the islands and shores of the Gulf of California are several species of the genus *Homalonychus*, which is peculiar to this region and the immediately adjacent parts. Other species of related genera of the same family, the *Zodariidæ*, are found elsewhere in America chiefly in South America, where they are found as far south as Patagonia.

Other genera restricted to this region or to it and immediately adjacent parts of Mexico and the United States (California, Arizona, New Mexico) are such as *Plectreurys*, *Digueta*, *Yumates*, a new genus, *Pericuris*, also a new genus, *Nodocion*, a gnaphosid genus represented by a considerable number of species as hereafter shown, *Chemmis*, *Anachemmis*, *Ebo* and *Syspira*.

The genus *Megamyrmecon*, represented by a number of species in California and the Gulf of California area is known elsewhere in America only in Chile, where one species has been reported. It occurs, however, as the genus is at present construed, also in the desert regions of Africa and in Madagascar and India. *Zimiris*, represented by at least one species in the cape region of Lower California and closely related to the new genus *Pericuris* mentioned above, is also known otherwise only from southern Arabia and from India.

An interesting case of discontinuous distribution is furnished by the peculiar six-eyed agelenid genus *Chorizomma*. Of this genus two species are known from California and Lower California but it has been found elsewhere only in southern France and in Spain. This is one of many similar cases afforded by widely diverse groups of organisms in which forms of the Pacific coast of North America have their nearest relatives in western Europe.

The spiders of the present collection taken at the different stations are listed below. The islands named between the last of the Sonoran and the first of the Lower Californian stations are nearer to and are believed to belong faunistically more closely to Sonora, while the islands adjacent to the peninsula are given after the stations of the latter.

ARIZONA

Nogales

Eurytelma sp. b.; *Filistata hibernalis* Hentz; *Herpyllus validus* (Banks); *Psilochorus pullulus* (Hentz); *Latrodectus mactans* (Fabricius); *Horodromus absolutus* new species; *Lycosa carolinensis* Walckenaer; *Phidippus johnsoni* (Peckham); *Dendryphantès diplacis* new species; *Pellenes hirsutus* (Peckham).

SONORA

San Pedro Bay

Evagrus pragmaticus new species; *Ulaborus crepidinis* new species; *Loxosceles rufescens* (Dufour); *Scytodes fusca* Walckenaer; *Tarsonops systematicus* new species; *Homalonychus positivus* new species; *Psilochorus utahensis* Chamberlin; *Latrodectus mactans* (Fabricius); *Olios* sp.; *Selenops actophilus* new species; *Ctenus hibernalis* Hentz; *Syspira* sp.; *Chemmis monisticus* new species; *Arctoa littoralis* (Hentz); *Sosiphus pragmaticus* new species; *Pellenes pyrrithrix* new species.

San Carlos Bay

Eurytelma sp. b.; *Scytodes fusca* Walckenaer; *Theridion analyticum* new species; *Olios* sp.; *Selenops actophilus* new species; *Corinna epicureana* new species; *Sosiphus pragmaticus* new species; *Hamataliva positiva* new species; *Thiodina sylvana* (Hentz); *Dendryphantès zygoballoides* new species; *Pellenes pyrrithrix* new species.

Tepoca Bay

Ariadna pragmatica new species; *Cesonia classica* new species; *Gnaphosa synthetica* new species; *Cyclosa turbinata* (Walckenaer); *Meteteira labyrinthea* (Hentz); *Araneus detrimentosus* (Cambridge); *Eustala anastera buliafera* new subspecies; *Olios* sp.

Guaymas

Filistata hibernalis Hentz; *Plectreurus tristis* Simon; *Scytodes fusca* Walckenaer; *Ariadna bicolor* (Hentz) a; *Nodocion eclecticus* new species; *Nodocion* sp.; *Cesonia classica* new species; *Zelotes protestans* new species; *Zelotes reformans* new species; *Homalonychus positivus* new species; *Latrodectus mactans* (Fabricius); *Lithyphantes punctulatus* Marx; *Misumenops celer* (Hentz); *Misumenops dubius* (Keyserling); *Selenops actophilus* new species; *Syspira analytica* new species; *Syspira synthetica* new species; *Syspira longipes* Simon; *Lycosa carolinensis* Walckenaer; *Salpicus scenicus* (Clerck); *Menemerus bivittatus* (Dufour); *Wala poenitens* new species; *Phidippus arizonensis* (Peckham).

GEORGES ISLAND

Plectreurus tristis Simon.

PATOS ISLAND

Plectreurus bispinosus new species; *Scytodes fusca* Walckenaer; *Ariadna scholastica* new species; *Latrodectus mactans* (Fabricius); *Lithyphantes punctulatus* Marx; *Cyclosa turbinata* (Walckenaer); *Araneus detrimentosus* (Cambridge); *Mimetus hesperus* Chamberlin; *Olios naturalisticus* new species; *Syspira synthetica* new species.

TIBURON ISLAND

Evagrus empiricus new species; *Scytodes fusca* Walckenaer; *Nodocion* sp.; *Gnaphosa synthetica* new species; *Zelotes* sp.; *Homalonychus positivus* new species; *Theridion analyticum* new species; *Ceraticelus nesiotus* Crosby, new species; *Argiope argentata* (Fabricius); *Cyclosa turbinata* (Walckenaer); *Olios naturalisticus* new species; *Selenops* sp.; *Ctenus hibernalis* Hentz; *Syspira* sp.; *Trachelas speciosus* Banks; *Thiodina sylvana* (Hentz); *Phidippus arizonensis* (Peckham); *Dendryphantes zygoballoides* new species.

PELICAN ISLAND

Filistata hibernalis Hentz; *Scytodes fusca* (Walckenaer); *Zelotes* sp.; *Latrodectus mactans* (Fabricius); *Argiope argentata* (Fabricius); *Araneus detrimentosus* (Cambridge); *Syspira synthetica* new species.

SAN ESTEBAN ISLAND

Eurypelma sp. b.; *Uloborus crepidinis* new species; *Dictyna volucris* Keyserling; *Dictyna secuta* new species; *Loxosceles rufescens* (Dufour); *Pericuris insularis* new species; *Theridion analyticum* new species; *Lithyphantes punctulatus* Marx; *Larinia cymotypa* new species; *Selenops* sp.; *Oxyopeidon absolutum* new species; *Phidippus arizonensis* (Peckham); *Pellenes angelus* new species.

SAN PEDRO MARTIR ISLAND

Scytodes fusca Walckenaer; *Herpyllus validus* (Banks); *Lithyphantes punctulatus* Marx; *Thanatus peninsulanus* Banks; *Selenops* sp.; *Sassacus vanduzeei* new species.

SAN PEDRO NOLASCO ISLAND

Uloborus oweni new species; *Filistata hibernalis* Hentz; *Scytodes fusca* Walckenaer; *Nodocion pragmaticus* new species; *Megamyrmeleon* sp.; *Theridion analyticum* new species; *Lithyphantes punctulatus* Marx; *Metepeira labyrinthica* (Hentz); *Selenops* sp.; *Phidippus arizonensis* (Peckham).

LOWER CALIFORNIA

Ensenada

Citharoceps fidicina new species; *Cesonia classica* new species; *Zelotes* sp.; *Drassyllus empiricus* new species; *Thanatus retentus* Chamberlin; *Anachemmis sober* Chamberlin; *Cybæus tardatus* (Chamberlin); *Agelena navia* Walekenaer; *Chorizomma californicum* Simon; *Phidippus formosus* (Peckham); *Pellenes dolosus* Peckham.

San Luis Gonzaga Bay

Filistata hibernalis Hentz; *Plectreurys valens* new species; *Homalonychus theologus* new species; *Misumenops celer* (Hentz); *Salticus palpalis* Banks; *Dendryphantes imperialis* (Peckham); *Pellenes corticolens* new species.

Angeles Bay

Filistata hibernalis (Hentz); *Loxosceles rufescens* (Dufour); *Scytodes fusca* Walekenaer; *Megamyrmecon pessimisticum* new species; *Zelotes monachus* new species; *Drassyllus rationalis* new species; *Homalonychus rationalis* new species; *Lithyphantes pulcher* Keyserling; *Lithyphantes punctulatus* Marx; *Olios* sp.; *Selenops* sp.; *Syspira analytica* new species; *Syspira* sp.; *Trachelas speciosus* Banks; *Trachelas* sp.; *Corinna* sp.; *Agelena* sp.; *Pardosa sabulosa* Banks; *Lycosa concolor* Banks; *Thiodina sylvana* (Hentz); *Marpissa californica* (Peckham); *Pellenes elegans* Peckham.

Las Animas Bay

Filistata hibernalis Hentz; *Scytodes fusca* Walekenaer; *Zelotes* sp.; *Misumenops celer* (Hentz); *Syspira* sp.; *Trachelas speciosus* Banks; *Agelena* sp.; *Thiodina sylvana* (Hentz); *Marpissa californica* (Peckham); *Pellenes elegans* Peckham.

San Francisquito Bay

Dictyna volucripes Keyserling; *Plectreurys tristis* Simon; *Physocyclus mysticus* new species; *Theridion studiosum* Hentz; *Theridion geminipunctum* new species; *Latrodectus mactans* (Fabricius); *Argiope argentata* (Fabricius); *Eustala* sp.; *Misumenops celer* (Hentz); *Syspira synthetica* new species; *Trachelas* sp.; *Oxyopes actophilus* new species; *Marpissa californica* (Peckham); *Dendryphantes imperialis* (Peckham); *Dendryphantes chera* new species; *Pellenes dolosus* Peckham; *Pellenes elegans* new species.

Mulegé

Evagrus empiricus new species; *Dictyna mulegensis* new species; *Loxosceles rufescens* (Dufour); *Nodocion realisticus* new species; *Theridion realisticum* new species; *Misumenops celer* (Hentz); *Selenops* sp.; *Trachelas speciosus* Banks; *Pardosa orthodox* new species; *Pardosa sabulosa* Banks; *Arctosa littoralis* (Hentz); *Peucetia viridans* (Hentz); *Icius vitis* (Cockerell); *Pellenes delectus* Peckham; *Pellenes anepsius* new species.

Concepcion Bay

Dictyna volucrifera Keyserling; *Filistata hibernalis* Hentz; *Scytodes fusca* Walckenaer; *Tarsonops clavis* new species; *Euryopsis californica* Banks; *Latrodectus mactans* (Fabricius); *Eustala* sp.; *Gasteracantha caneriformis* Linnæus; *Gayenna absoluta* new species; *Anyphana* sp.; *Oxyopeidon absolutum* new species; *Thiodina sylvana* (Hentz); *Dendryphantes imperialis* (Peckham); *Dendryphantes melanomerus* new species; *Pellenes elegans* Peckham.

San Evaristo Bay

Fraxus empiricus new species; *Theridion analyticum* new species; *Trachelas* sp.

San Nicolas Bay

Lithyphantes pulcher Keyserling; *Misumenops celer* (Hentz); *Lycosa carolinensis* Walckenaer.

Loreto (Including Cuesta Blanca)

Evagrus empiricus new species; *Eurytelma* sp. b.; *Filistata hibernalis* Hentz; *Plectreurus valens* new species; *Scytodes fusca* Walckenaer; *Artema atlanta* Walckenaer; *Misumenops celer* (Hentz); *Selenops* sp.; *Syspira* sp.

Puerto Escondido

Plectreurus valens new species; *Loxosceles rufescens* (Dufour); *Scytodes fusca* Walckenaer; *Scaphiella litoris* new species; *Megamyrmecon asceticum* new species; *Hamalonychus theologus* new species; *Physocyclus mysticus* new species; *Psilochorus dogmaticus* new species; *Lithyphantes pulcher* Keyserling; *Lithyphantes punctulatus* Marx; *Erigone eschatalogica* Crosby, new species; *Tetragnatha eremita* new species; *Misumenops celer* (Hentz); *Selenops nesophilus* new species; *Selenops* sp.; *Anyphæna johnstoni* new species; *Syspira synthetica* new species; *Trachelas* sp.; *Pardosa sabulosa* Banks; *Peucetia viridans* (Hentz).

Agua Verde Bay

Filistata hibernalis Hentz; *Poecilochroa* sp.; *Selenops* sp.; *Syspira* sp.; *Marpissa californica* (Peckham); *Pellenes elegans* Peckham.

La Paz

Dictyna volucrifera Keyserling; *Filistata hibernalis* Hentz; *Yumates nesophila* new species; *Hamalonychus theologus* new species; *Psilochorus* sp.; *Theridion positivum* new species; *Theridion analyticum* new species; *Lithyphantes punctulatus* Marx; *Cyclosa bifurca* (McCook); *Cyclosa turbinata* (Walckenaer); *Cyclosa walckenaeri* (Cambridge); *Olios* sp.; *Selenops* sp.; *Agelena* sp.; *Pardosa sternalis* (Thorell); *Dendryphantes imperialis* (Peckham.)

SAN LUIS ISLAND

Orthonops oertus new species; *Megamyrmecon naturalisticum* new species; *Gnaphosa synthetica* new species.

MEJIA ISLAND

Filistata hibernalis Hentz; *Diguetia stridulans* new species; *Homalonychus theologus* new species; *Lithyphantes punctulatus* Marx; *Metepeira labyrinthea* (Hentz); *Syspira synthetica* new species.

GRANITE ISLAND

Filistata hibernalis Hentz; *Scytodes fusca* Walckenaer; *Teutana nesiotis* new species; *Teutana* sp.

ANGEL DE LA GUARDA ISLAND

Dictyna volucrifpes Keyserling; *Filistata hibernalis* Hentz; *Loxosceles rufescens* (Dufour); *Scytodes fusca* Walckenaer; *Yumates angela* new species; *Nodocion pragmaticus* new species; *Lithyphantes punctulatus* Marx; *Ceraticelus nesiotis* Crosby, new species; *Argiope argentata* (Fabricius); *Metargiope trifasciata* (Forsk.); *Larinia cymolyfa* new species; *Misumenops celer* (Hentz); *Ebo mexicanus* Banks; *Olios* sp.; *Selenops nesophilus* new species; *Chiracanthium inclusum* (Hentz); *Syspira* sp.; *Agelena* sp.; *Oxyopeidon absolutum* new species; *Dendryphantes imperialis* (Peckham); *Pellenes elegans* Peckham; *Pellenes angelus* new species.

BALLENA ISLAND

Evagrus josephus new species; *Dictyna volucrifpes* Keyserling; *Filistata hibernalis* Hentz; *Plectreuryx tristis* Simon; *Pericuris insularis* new species; *Megamyrmecon asceticum* new species; *Zelotes calvanisticus* new species; *Homalonychus* sp.; *Physocyclus mysticus* new species; *Psilochorus* sp.; *Lithyphantes punctulatus* Marx; *Syspira analyticalis* new species; *Pellenes elegans* Peckham.

SAL SI PUEDES ISLAND

Filistata hibernalis Hentz; *Cesonia classica* new species; *Lithyphantes punctulatus* Marx; *Cyclosa turbinata* (Walckenaer); *Selenops* sp.; *Syspira* sp.

SMITH ISLAND

Lithyphantes punctulatus Marx; *Selenops* sp.

ISLA PARTIDA

Eurypelma sp. b.; *Dictyna volucrifpes* Keyserling; *Filistata hibernalis* Hentz; *Loxosceles rufescens* (Dufour); *Scytodes fusca* Walckenaer; *Scytodes redempta* new species; *Ariadna philosopha* new species; *Megamyrmecon* sp.; *Psilochorus*

agnosticus new species; *Latrodectus mactans* (Fabricius); *Lithyphantes punctulatus* Marx; *Cyclosa turbinata* (Walckenaer); *Metepeira labyrinthea* (Hentz); *Ebo mexicanus* Banks; *Selenops* sp.; *Syspira eclectica* new species; *Pellenes hirsutus* Peckham.

ISLA RAZA

Dictyna volucripes Keyserling; *Filistata hibernalis* Hentz; *Nodocion syntheticus* new species; *Megamyrmecon* sp.; *Zelotes* sp.; *Psilochorus agnosticus* new species; *Latrodectus mactans* (Fabricius); *Cyclosa turbinata* (Walckenaer); *Ebo mexicanus* Banks; *Selenops nesophilus* new species.

NORTH SAN LORENZO ISLAND

Dictyna volucripes Keyserling; *Filistata hibernalis* Hentz; *Loxosceles rufescens* (Dufour); *Scytodes fusca* Walckenaer; *Psilochorus* sp.; *Theridion positivum* new species; *Lithyphantes punctulatus* Marx; *Argiope argentata* (Fabricius); *Metepeira labyrinthea* (Hentz); *Olios pragmaticus* new species; *Selenops* sp.; *Syspira* sp.; *Dendryphantes zygoballoides* new species.

SOUTH SAN LORENZO ISLAND

Eurypelma sp. b.; *Dictyna volucripes* Keyserling; *Filistata hibernalis* Hentz; *Loxosceles rufescens* (Dufour); *Theridion geminipunctum* new species; *Metepeira labyrinthea* (Hentz); *Araneus gemmus* (McCook); *Misumenops celer* (Hentz); *Olios pragmaticus* new species; *Agelena* sp.; *Calotes* sp.; *Marpissa californica* (Peckham); *Dendryphantes zygoballoides* new species; *Pellenes dolosus* Peckham.

TORTUGA ISLAND

Evagrus josephus new species; *Filistata hibernalis* Hentz; *Ariadna bicolor* (Hentz) c; *Megamyrmecon asceticum* new species; *Physocyclus mysticus* new species; *Psilochorus dogmaticus* new species; *Lithyphantes punctulatus* Marx; *Argiope argentata* (Fabricius); *Olios* sp.; *Selenops nesophilus* new species; *Lycosa concolor* Banks; *Oxyopes actophilus* new species; *Hamataliwa* sp.; *Dendryphantes chera* new species.

SAN MARCOS ISLAND

Evagrus scepticus new species; *Uloborus crepidinis* new species; *Filistata hibernalis* Hentz; *Plectreureys valens* new species; *Scytodes fusca* Walckenaer; *Scytodes poenitens* new species; *Scaphiella litoris* new species; *Yumales nesophila* new species; *Psilochorus dogmaticus* new species; *Latrodectus mactans* (Fabricius); *Erigone eschatologica* Crosby, new species; *Argiope argentata* (Fabricius); *Cyclosa turbinata* (Walckenaer); *Eustala* sp.; *Misumenops celer* (Hentz); *Selenops* sp.; *Anypheana johnstoni* new species; *Pardosa sabulosa* Banks; *Peucetia viridans* (Hentz); *Dendryphantes zygoballoides* new species; *Pellenes elegans* Peckham.

SANTA INEZ ISLAND

Filistata hibernalis Hentz; *Cesonia classica* new species; *Psilochorus* sp.; *Latrodectus mactans* (Fabricius); *Cyclosa turbinata* (Walckenaer); *Eustala anastera leuca* new subspecies; *Selenops* sp.; *Syspira eclectica* new species; *Syspira* sp.; *Pellenes divaricatus* Banks.

ILDEFONSO ISLAND

Filistata hibernalis Hentz; *Ariadna bicolor* (Hentz) b.; *Latrodectus mactans* (Fabricius); *Cyclosa turbinata* (Walckenaer); *Misumenops celer* (Hentz); *Selenops* sp.; *Syspira analytica* new species; *Syspira* sp.; *Icius ildefonsus* new species.

CORONADOS ISLAND

Filistata hibernalis Hentz; *Plectreurys valens* new species; *Scytodes fusca* Walckenaer; *Homalonychus theologus* new species; *Psilochorus* sp.; *Lithyphantes punctulatus* Marx; *Micrathena funebris* (Marx); *Oxyopeidon absolutum obliquum* new subspecies; *Marpissa californica* (Peckham).

CARMEN ISLAND

Uloborus oweni new species; *Dictyna volucris* Keyserling; *Oecobius isolatus* new species; *Plectreurys ceralbonus* new species; *Loxosceles rufescens* (Dufour); *Diguetia dialectica* new species; *Yumates nesophila* new species; *Homalonychus theologus* new species; *Psilochorus dogmaticus* new species; *Psilochorus* sp.; *Lithyphantes punctulatus* Marx; *Eustala* sp.; *Ebo mexicanus* Banks; *Olios* sp.; *Selenops* sp.; *Syspira* sp.; *Agelena* sp.; *Peucetia viridans* (Hentz); *Marpissa californica* (Peckham); *Phidippus arizonensis* (Peckham); *Dendryphantes imperialis* (Peckham); *Dendryphantes limbatus* (Banks); *Dendryphantes carmenensis* new species.

DANZANTE ISLAND

Plectreurys valens new species; *Segestria danzantica* new species; *Megamyrmeleon nesiotis* new species; *Homalonychus theologus* new species; *Psilochorus* sp.; *Selenops* sp.

MONSERRATE ISLAND

Eurytelma sp. a.; *Dictyna parvita* new species; *Filistata hibernalis* Hentz; *Plectreurys tristis* Simon; *Loxosceles rufescens* (Dufour); *Cesonia classica* new species; *Psilochorus* sp.; *Lithyphantes punctulatus* Marx; *Selenops* sp.; *Pellenes divaricatus* (Banks).

SANTA CATALINA ISLAND

Uloborus saphes new species; *Scytodes fusca* Walckenaer; *Ariadna bicolor* (Hentz) b.; *Selenops nesophilus* new species; *Pellenes polius* new species.

LAS GALERAS ISLAND

Filistata hibernalis Hentz; *Scaphiella hespera* new species; *Cyrtosia turbinata* (Walckenaer); *Metespira labyrinthica* (Hentz); *Eustala anastera buliafera* new subspecies; *Syspira analytica* new species; *Syspira synthetica* new species.

SANTA CRUZ ISLAND

Filistata hibernalis Hentz; *Loxosceles rufescens* (Dufour); *Ariadna bicolor* (Hentz) d.; *Homalonychus theologus* new species; *Lithyphantes punctulatus* Marx; *Syspira* sp.

SAN DIEGO ISLAND

Plectreureys tristis Simon; *Ariadna bicolor* (Hentz) d.; *Megamyrmeleon nesiotus* new species; *Megamyrmeleon* sp.; *Zelotes* sp.; *Latrodectus mactans* (Fabricius); *Lithyphantes punctulatus* Marx; *Syspira* sp.; *Dendryphantes chera* new species.

SAN JOSEF ISLAND

Dictyna volucrifera Keyserling; *Dictyna* sp.; *Filistata hibernalis* Hentz; *Nodocion realisticus* new species; *Homalonychus theologus* new species; *Psilochorus* sp.; *Theridion positivum* new species; *Theridion analyticum* new species; *Lithyphantes punctulatus* Marx; *Argiope argentata* (Fabricius); *Micrathena funebris* (Marx); *Selenops* sp.; *Syspira eclectica* new species; *Syspira synthetica* new species; *Oxyocheidon absolutum* new species; *Dendryphantes chera* new species.

SAN FRANCISCO ISLAND

Homalonychus theologus new species; *Lithyphantes punctulatus* Marx; *Argiope argentata* (Fabricius); *Gasteracantha cancriformis* (Linnæus); *Misumenops celer* (Hentz); *Olios positivus* new species; *Selenops* sp.; *Phidippus arizonensis* (Peckham); *Pellenes elegans* Peckham; *Pellenes ammophilus* new species.

ESPIRITU SANTO ISLAND

Uloborus oweni new species; *Plectreureys tristis* Simon; *Diguetia canities* (McCook); *Zelotes catholicus* new species; *Homalonychus theologus* new species; *Psilochorus dogmaticus* new species; *Psilochorus* sp.; *Lithyphantes punctulatus* Marx; *Argiope argentata* (Fabricius); *Gasteracantha cancriformis* (Linnæus); *Syspira* sp.; *Arctosa littoralis* (Hentz); *Marpissa californica* (Peckham); *Phidippus arizonensis* (Peckham); *Dendryphantes imperialis* (Peckham); *Dendryphantes limbatus* (Banks).

CERALBO ISLAND

Uloborus oweni new species; *Filistata hibernalis* Hentz; *Plectreurys ceralbonus* new species; *Scytodes fusca* Walckenaer; *Tarsonops sectifus* new species; *Nopsides ceralbona* new species; *Pericuris insularis* new species; *Psilochorus dogmaticus* new species; *Psilochorus* sp.; *Teulana nesiotles* new species; *Lithyphantes punctulatus* Marx; *Argiope argentata* (Fabricius); *Cyclosa bifurca* (McCook); *Misumenops celer* (Hentz); *Olios scepticus* new species; *Selenops* sp.; *Syspira* sp.; *Dendryphantes imperialis* (Peckham); *Pellenes ammophilus* new species.

The collecting of the arachnids on the California Academy of Sciences expedition of 1921 was in the special charge of Joseph C. Chamberlin who is to be congratulated on the fine lot of material secured. Unless otherwise indicated in connection with the locality records under the various species, it is to be understood in each case that the specimens were collected by him. Many specimens were taken also by E. P. Van Duzee incidentally to his own more particular objectives. Assistance was given in collecting at various times likewise by I. M. Johnston and Virgil Owen. In addition to the species belonging to this collection some new forms from other localities, such as California in particular, which were noted in the course of this study, are described in an accompanying paper.

The author is under obligations to Dr. Barton Warren Evermann and E. P. Van Duzee of the California Academy of Sciences for the opportunity of studying this important collection, and to J. C. Chamberlin and I. M. Johnston for details of information given in the course of the work. His particular thanks are due Prof. C. R. Crosby of Cornell University for supplying descriptions of several species in the Linyphiidæ, which must accordingly bear his name as hereafter indicated in each such case. Prof. Crosby also supplied illustrations made by J. W. Force of these and several related species. Mr. Force's monogram accompanies each of these drawings. All other drawings in the paper were made by the author.

LIST OF THE SPECIES

AVICULARIIDÆ

1. *Evagrus empiricus* Chamberlin, new species

Female: Carapace dark brown of chestnut cast, the chelicerae similar. Legs and sternum brown. Abdomen purplish grey, the spinnerets brown, lighter at tips. Anterior median eyes only about one-half their radius from lower margin of clypeus. Anterior median eyes fully as far, or a little farther, from the posterior median eyes than from each other. Posterior median eyes a little larger than anterior median eyes; broadly obovate in shape, fully half their radius from the posterior lateral eyes. Posterior row of eyes very nearly straight, only slightly recurved. Lower margin of chelicera with eleven dark teeth, the upper with none, as usual. Spinnerets three-fourths, or a little more, as long as the abdomen. Length, 17 mm. Length of cephalothorax, 7 mm.

Type: Female, No. 1359, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 14, 1921, at **Mulegé, Lower California**. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z. Cuesta Blanca, ten to fifteen miles north of Loreto, May 20, 1921 (young); San Evaristo Bay, June 10, 1921; Tiburon Island, April 23, 1921, one immature female.

Characterized by close proximity of anterior median eyes to margin of clypeus, the nearly equidistant median eyes, and the essentially straight posterior eye row. In the young paratype from north of Loreto, the posterior row of eyes is more procurved, but in that from Tiburon and San Evaristo it is essentially straight as in the holotype.

2. *Evagrus pragmaticus* Chamberlin, new species

Fig. 1. *Evagrus pragmaticus*, tibia and metatarsus of leg II of male, posterior side.

Male: Carapace light brown of slightly chestnut cast. Sternum clearer brown. Legs also brown with anterior pairs slightly chestnut. Abdomen dark grey, the spinnerets brown. Anterior median eyes about three-fourths their longer diameter from lower margin of clypeus. Anterior median eyes their longer radius, or a little more, apart and nearly as far from the posterior median eyes. Posterior median eyes subcircular, a little angled, considerably larger than the anterior median eyes, close to, but plainly separated from, the posterior laterals. Leg I in general as in preceding species. Tibia II with spurs of process as in *clarus* but the process and joint as a whole somewhat differently formed and related. A conspicuous difference from *clarus* is presented in tibia II in which there is a second and more pronounced process toward the distal end which is lacking in *clarus*. (Fig. 1). Posterior spinnerets equal in length to abdomen. Palpus very similar to that of *josephus*. Length, 10.25 mm.

Type: Male, No. 1360, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, July 7, 1921, at San Pedro Bay, Sonora. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z., same data.

3. *Evagrus josephus* Chamberlin, new species

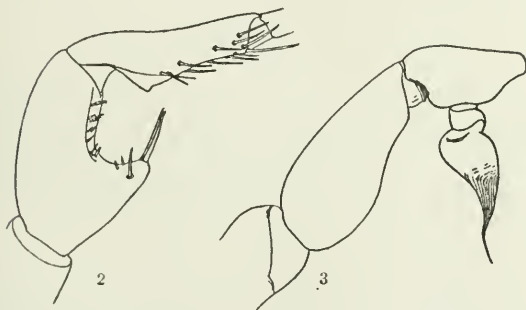


Fig. 2. *Evagrus josephus*, right leg II of male, posterior side.

Fig. 3. Right male palpus, ectal view.

Male: Carapace and sternum brownish yellow; legs light brown; abdomen dark grey. Anterior median eyes not more than their radius from lower margin of clypeus. Anterior row of eyes strongly procurved; medians much smaller than laterals, somewhat more than their radius apart and nearly the same distance from the posterior medians. Posterior median eyes obviously larger than anterior medians, nearly contiguous with the posterior laterals. Tibia I with numerous long spines beneath; tibia II enlarged, with the characteristic projection beneath as in *E. mexicanus* Ausserer but this with apex more nearly

below middle of the article; this process bearing at apex two long, stout spines, which project nearly parallel to axis of joint, and ectad of these a smaller one; on caudal edge three or four smaller spines; ventral surface distad of process bearing numerous short spines. Metatarsus II with an angular prominence toward base instead of toward distal end as it is in *mexicanus*, (fig. 2). Palpus as represented in fig. 3. Length, 12 mm.

Type: Male, No. 1361, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 11, 1921, on **Tortuga Island, Gulf of California**. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z.; Tortuga Island, May 11, 1921, one immature individual; Ballena Island, June 9, 1921, one male.

The male from Ballena Island has the posterior median eyes proportionately smaller than in the type.

Mr. Chamberlin's field note on the Tortuga specimen states that this form spins "irregular, branching silken tubes under stones, etc. Collected for the most part near the summit of the island around rim of the crater; elevation 500-1000 feet."

4. *Evagrus scepticus* Chamberlin, new species

Male: Carapace, sternum and legs yellowish brown. Abdomen yellowish grey beneath and over sides, dark grey or blackish over dorsum. Anterior median eyes less than their radius from lower margin of clypeus, about their radius apart, a little nearer to the posterior laterals, which are equal in size to the anterior median eyes or a little longer. Unfortunately, both first and second legs of the holotype are lost. Spinnerets longer than abdomen. Palpus as in *josephus*, but stylus of bulb straighter. Length, 9 mm. Length of cephalothorax, 4.2 mm.

Type: Male, No. 1362, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 18, 1921, on **San Marcos Island, Gulf of California**. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z.; same data, three females.

A smaller and lighter colored species than the others here described. The field note states: "The web-weaving aviculariids comparatively common under stones."

Eurypelma sp. *a*

Three adult females which cannot be safely referred to their species without a study of males, since several species

from the southwestern United States and Lower California are at present known from males only, and of certain others the females are insufficiently described. The present species differs from *steindachneri* and *hentzii* (Dugesiella) in lacking distinctly spine-like setæ on the anterior face of coxa I.

Locality: Monserrate Island, May 25, 1921, three females.

Eurypelma species *b*

Young individuals, which usually have the black spot on the abdomen such as present, e. g., *E. steindachneri*, were taken at several localities. They cannot be identified specifically.

Localities: Nogales, Arizona, April 4, 1921, one, E. P. Van Duzee; San Carlos Bay, July 8, 1921, one; Loreto, May 19, 1921, one; San Esteban Island, April 9, 1921, one; Isla Partida, April 22, 1921, three; South San Lorenzo Island, June 24, 1921, one.

ULOBORIDAE

5. *Uloborus oweni* Chamberlin, new species



Fig. 4. *Uloborus oweni*, epigynum, ventral view.

Female: Carapace black, with a whitish border on each side, and an arrow-head-shaped light area on pars cephalica followed on pars thoracica with a light area more or less geminate by a median black line. Sternum black. Femur of leg I black, with a longitudinal light mark on basal half on anterior and one on posterior surface and a white ring just distad of the middle; tibia also blackish with a light ring at base and one at middle; metatarsus lighter, with a short black annulus at distal end; tarsus light. Femur of second and following legs black with a wide white annulus each side of middle, the tibia with a light annulus at base and one at middle, the metatarsus light excepting a black annulus just distad of base and a narrow annulus at distal end. Abdomen silvery white above with a dark median longitudinal line at base and several cross marks of black behind, the chief of these being at the level of the posterior humps. Sides of abdomen crossed by oblique black bands and spots. Venter light at sides but middle region black throughout length, the

black area typically enclosing two or three pairs of light curved marks. The abdomen bears a pair of dorsal humps just in front of middle; in front of them it rises still higher and shows typically two slighter nodules or bosses in front of the others; behind the middle descending concavely but elevated at caudal end above the spinnerets instead of slanting directly to these. Epigynum, fig. 4. Length, 5.2 mm.

Type: Female, No. 1363, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 23, 1921, at Marquer Bay, **Carmen Island, Gulf of California**. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z., same data as type, seven females, J. C. Chamberlin, Virgil Owen and I. M. Johnston; Arroyo at El Mostrador, Ceralbo Island, June 8, 1921; three specimens; San Pedro Nolasco Island, April 17, 1921, four immature specimens; San Gabriel Bay, Espiritu Santo Island, June 1, 1921, one; San Pedro Bay, July 7, 1921, two.

6. *Uloborus crepidinis* Chamberlin, new species



Fig. 5. *Uloborus crepidinis*, epigynum.

Female: Carapace yellowish over sides and along middle, a dark longitudinal stripe on each side between these paler areas. Sternum blackish. Leg I yellowish throughout excepting somewhat more than the distal third of the tibia, which is black, or the femur somewhat dusky above. Other legs yellowish throughout, without dark annuli, excepting the femora which may have two dark cross marks above. Abdomen above yellowish, with a median black area on posterior portion, furcate in front and enclosing a light mark behind. Sides of abdomen dusky brown. Venter in front of rima genitalis brown, behind it in middle brownish yellow, at sides yellow. Abdomen less elevated in front than in most, bearing there the usual two humps, dorsum slanting but moderately caudad, posteriorly protruding a little above and behind the spinnerets, caudally rounded. Epigynum, fig. 5. Length, 4 mm.

Type: Female, No. 1364, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 19, 1921, from its web under a ledge of rock at an elevation of about 100 feet on **San Esteban**

Island, Gulf of California. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z.; San Marcos Island, May 12, 1921, one female; San Pedro Bay, Sonora, July 7, 1921, one female.

7. *Uloborus saphes* Chamberlin, new species

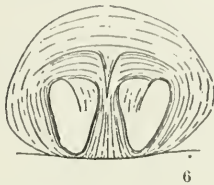


Fig. 6. *Uloborus saphes*, epigynum.

Female: Carapace uniform black. Sternum and coxæ of legs beneath black. Leg I with femur, patella and tibia solid black; metatarsus yellow proximally, solid black over more than distal third; tarsus yellow proximally, dark distally. Following legs have femur black with a narrow yellow ring at base and one at middle; patella black; tibia black with an annulus of whitish color at middle and a less distinct one at proximal end; metatarsus with a white annulus at base and one at middle, elsewhere blackish or brown; tarsus whitish over proximal half, blackish or brown over distal half. Abdomen blackish above, with two pairs of light marks caudad of middle, two light areas in front of tubercles, with an oblique light mark in front of middle; venter with a brownish stripe along each side, but solid black over middle region from end to end. Abdomen moderately elevated anteriorly, with two weak tubercles; dorsum slanting gradually to spinnerets. Epigynum, fig 6. Length, 3.2 mm.

Type: Female, No. 1365, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 12, 1921, on Santa Catalina Island, Gulf of California.

DICTYNIDÆ

8. *Dictyna volucris* Keyserling

Verh. Zool. bot. Ges. Wien, 1881, XXXI, p. 286, pl. 11, f.11.

Localities: La Paz, April 11, 1921, one male; San Francisquito Bay, May 10, 1921, one male, three females; Concepcion Bay, June 17, 1921, one immature female; San Esteban Island, April 20, 1921, two females, E. P. Van Duzee; Isla Raza, April 21, 1921, one female; South San Lorenzo Island, May 9, 1921, several females; Puerto Ballandra, Carmen Island, May 21, 1921, immature female, E. P. Van Duzee; Ballena Island, June 8, 1921, one female;

San Josef Island, June 10, 1921, one female; North San Lorenzo Island, June 24, 1921, one male, ten females, partly immature; Isla Partida, about July 1, one male and five females, June 25, 1921, one female; Angel de la Guarda Island, June 29, 1921, one male, E. P. Van Duzee; Pond Island, July 2, 1921, one male.

A common species in the United States, occurring from Massachusetts to California.

9. *Dictyna mulegensis* Chamberlin, new species



Fig. 7. *Dictyna mulegensis*, left palp of male, ectal view.

Fig. 8. Caudal process of bulb of same, ventral view, more enlarged.

Fig. 9. Dorsal view of patella and tibia of same.

Male: Carapace blackish brown, with the usual white hairs. Legs yellow. Abdomen at present grey but not in condition to show original markings. Anterior median eyes smaller than the laterals but almost equalling the posterior medians. Area of median eyes about equal in width in front and behind. The species is characterized by the form of the palpus. The tibial apophysis suggests that of *D. volucripes* but is more strongly curved; on outer side of patella a characteristic setose lobe. Caudal spur of bulb as shown in figs. 7 and 8. Length, 2 mm.

Type: Male, No. 1366, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 15, 1921, at **Mulegé, Lower California.**

Resembles *D. volucripes* in general structure of palpus, but differs in processes of tibia and in the details of bulb, as, e. g., in form of caudal spur. It also differs in its clearly smaller anterior median eyes.

10. *Dictyna secuta* Chamberlin, new species

10

Fig. 10. *Dictyna secuta*, right palpus of male, cetal view.

Male: Carapace yellowish brown, the pars cephalica darker on sides behind, and the pars thoracica with a black marginal line on each side. Sternum yellowish brown, blackish about margins. Legs yellow, blackish at extreme distal end of tibiae and metatarsi. Dorsum of abdomen whitish with a median longitudinal black mark at base; sides black; venter whitish excepting just in front of spinnerets where blackish. Pars cephalica rather long and narrow in proportion to pars thoracica. Palpus as shown in fig. 10. Length, 2 mm.

Type: Male, No. 1367, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 19, 1921, on **San Esteban Island, Gulf of California**, "under bark of a loose-scaling mesquite tree."

11. *Dictyna parvita* Chamberlin, new species

11

Fig. 11. *Dictyna parvita*, epigynum.

Female: Carapace dusky brown, nearly black on the sides. Sternum, labium and endites blackish. Legs dusky over yellow, the black on tibiae more or less condensed into an annulus at base and one at distal end, and metatarsus with an annulus at distal end and one at middle; tarsus also darkened distally:

San Josef Island, June 10, 1921, one female; North San Lorenzo Island, June 24, 1921, one male, ten females, partly immature; Isla Partida, about July 1, one male and five females, June 25, 1921, one female; Angel de la Guarda Island, June 29, 1921, one male, E. P. Van Duzee; Pond Island, July 2, 1921, one male.

A common species in the United States, occurring from Massachusetts to California.

9. *Dictyna mulegensis* Chamberlin, new species



Fig. 7. *Dictyna mulegensis*, left palp of male, ectal view.

Fig. 8. Caudal process of bulb of same, ventral view, more enlarged.

Fig. 9. Dorsal view of patella and tibia of same.

Male: Carapace blackish brown, with the usual white hairs. Legs yellow. Abdomen at present grey but not in condition to show original markings. Anterior median eyes smaller than the laterals but almost equalling the posterior medians. Area of median eyes about equal in width in front and behind. The species is characterized by the form of the palpus. The tibial apophysis suggests that of *D. volucripes* but is more strongly curved; on outer side of patella a characteristic setose lobe. Caudal spur of bulb as shown in figs. 7 and 8. Length, 2 mm.

Type: Male, No. 1366, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 15, 1921, at Mulegé, Lower California.

Resembles *D. volucripes* in general structure of palpus, but differs in processes of tibia and in the details of bulb, as, e. g., in form of caudal spur. It also differs in its clearly smaller anterior median eyes.

10. *Dictyna secuta* Chamberlin, new species

10

Fig. 10. *Dictyna secuta*, right palpus of male, ectal view.

Male: Carapace yellowish brown, the pars cephalica darker on sides behind, and the pars thoracica with a black marginal line on each side. Sternum yellowish brown, blackish about margins. Legs yellow, blackish at extreme distal end of tibiae and metatarsi. Dorsum of abdomen whitish with a median longitudinal black mark at base; sides black; venter whitish excepting just in front of spinnerets where blackish. Pars cephalica rather long and narrow in proportion to pars thoracica. Palpus as shown in fig. 10. Length, 2 mm.

Type: Male, No. 1367, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 19, 1921, on San Esteban Island, Gulf of California, "under bark of a loose-scaling mesquite tree."

11. *Dictyna parcita* Chamberlin, new species

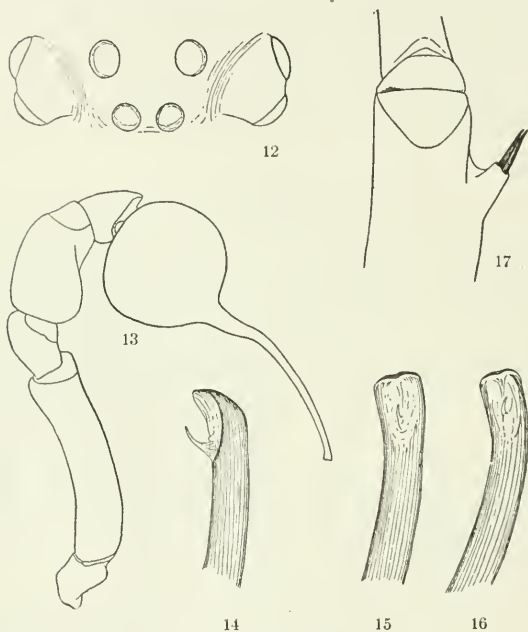
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Fig. 11. *Dictyna parcita*, epigynum.

Female: Carapace dusky brown, nearly black on the sides. Sternum, labium and endites blackish. Legs dusky over yellow, the black on tibiae more or less condensed into an annulus at base and one at distal end, and metatarsus with an annulus at distal end and one at middle; tarsus also darkened distally:

It seems desirable to separate *Plectreurys suprenans* Chamberlin, found in California, as a distinct genus. This is diagnosed hereafter as *Kibramoa*.

14. *Plectreurys bispinosus* Chamberlin, new species



- Fig. 12. *Plectreurys bispinosus*, eyes, dorsal view.
 Fig. 13. Right palpus of male, ectal view.
 Fig. 14. Tip of spine of bulb of same more enlarged.
 Fig. 15. Same, different view.
 Fig. 16. Same in another specimen.
 Fig. 17. Distal end of left leg I of male from below.

Male: Carapace, sternum and legs deep black, sometimes showing a weakly chestnut background. Abdomen grey.

Integument of carapace lightly coriaceous, in part finely punctate. Pars cephalica with a conspicuous depression along the middle caudad of the eye region. Posterior median eyes as large as the laterals; separated from each other by more than their diameter, a little farther from the laterals. Anterior median eyes much smaller than the posterior medians, separated from each other by their radius; the laterals a little larger than the medians but smaller than the posterior eyes; lateral eyes of each side on a prominent tubercle.

First legs long and robust; tibia with the characteristic spur at the distal end on the ectoventral side as in *P. tristis*, but this spur bears two contiguous spines instead of one (fig. 17). Both metatarsus I and tarsus I conspicuously bowed, the convexity dorsal. Metatarsus I at distal end with two stout spines on mesal side and two slender ones beneath. Tibia of palpus more than twice as long as the small patella, thickened as in *tristis* but with the swelling especially prominent at proximal end. Setæ of the femur borne on granules. Bulb large and subglobose. Spine much longer than the bulb, a little thickened at base, moderately curved and at the end slightly clavate as in *tristis* but not notched, and with a fine spine on one side (figs. 14 and 15). Length, 12 mm.

Female: Coloration and integument as in the male. Eyes as shown in fig. 12. Tibia and metatarsus of first legs not modified as in the male; tibia I with usually five spines under caudal border and four or five under anterior border, these short and widely separated. Length, up to 15 mm. Length of cephalothorax, 6.2 mm. Tib. + pat. I, 5.6 mm.

Type: Male, No. 1370, and *allotype*, female, No. 1371, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 23, 1921, on Patos Island, Gulf of California. *Paratype* male, in M. C. Z., same data.

15. *Plectreureys valens* Chamberlin, new species



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Fig. 18. *Plectreureys valens*, eyes, dorsal view.

Female: Cephalothorax and first joints of legs mahogany colored, the metatarsi and tarsi typically chestnut or lighter, the tibiae also sometimes light colored; abdomen grey.

Eye rows wider than usual; posterior row decidedly recurved, its eyes widely separated; median eyes once and a third, or more, their diameter apart and

once and five-sixths their diameter from the laterals; anterior median eyes with diameter about five-sixths that of the posterior medians, four-fifths their radius apart, and fully twice their diameter from the laterals. Legs exceptionally long, the fourth fully as long as, or a little longer than, the first. Tibia I with nine or ten spines below, four under the anterior border and five under the posterior; four to six spines on the anterior face and four or five on the posterior; the spines all long. Metatarsus I with ten spines beneath; three spines on anterior and three on posterior face; spines exceeding the diameter of the joint. Metatarsus about four-fifths as long as the tibia. Length, 12 mm.; cephalothorax, 5.1 mm.; tib. + pat. I, 6 mm.

Type: Female, No. 1372, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 21, 1921, at **Cuesta Blanca, 15 miles north of Loreto, Lower California, on the trail to Mulegé.** *Paratypes:* females in Mus. Calif. Acad. Sci. and M. C. Z., San Luis Gonzaga Bay, April 29, two females taken under stones less than one mile from beach; Puerto Escondido, May 29, one adult and two immature females taken under stones at mouth of gorge; San Marcos Island, May 12, two females, taken under stones at mouth of cañon; Coronados Island, May 18, one female; Danzante Island, May 24, one young female, probably of this species.

16. *Plectreurus ceralbonus* Chamberlin, new species

Female: Cephalothorax and legs pale chestnut in color; abdomen of a somewhat olive grey color, the hairs sparse.

Posterior row of eyes a little recurved; median eyes about once and a third their diameter apart and once and two-thirds their diameter from the laterals; anterior median eyes with diameter five-sixths that of the posterior medians; lateral eyes on each side not fully their radius apart. Tibia I with seven spines below, these not strictly paired excepting the two apical; four spines on anterior face and two on posterior; the ventral spines equalling the diameter of the joint or nearly so. Metatarsus I also with seven spines beneath; two spines on anterior face and none on posterior; ventral spines equalling or exceeding the diameter of the article.

Length, 6 mm.; cephalothorax, 3.1 mm.; tib. + pat. I equal in length to cephalothorax.

Type: Female, No. 1373, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 7, 1921, at **Rufo's ranch-house on west coast of Ceralbo Island, Gulf of California.** *Paratypes:* same data, one female; Puerto Ballandra, Carmen Island, May 21, one female.

17. *Plectreurus tristis* Simon

Ann. Soc. Ent. France, 1893, p. 300; Hist. Nat. Araign., 1893, I, p. 265, fig. 220-222.

Localities: Guaymas, Sonora, one female taken on a rocky hill northeast of the S. P. depot, April 15; San Francisquito Bay, May 10, one male; Georges Island, April 26, numerous specimens; Monserrate Island, May 25, one female, somewhat variant; Ballena Island, June 9, two females; San Diego Island, May 27, one female; Espiritu Santo Island, June 1, one female.

These specimens vary from deep black, as is typical, to chestnut. The posterior median eyes vary considerably as to size in comparison with the anterior medians and as to distance from each other. The species was previously known from Arizona.

Kibramoa Chamberlin, new genus

Agreeing with *Plectreurus* in the possession of eight eyes, in having the sternum acute behind, and in the structure of chelicerae and labium. It differs in its much longer and more slender legs and in not having the first pair noticeably more robust than the others. It differs in the male in wholly lacking a spur at the distal end of tibia I.

Genotype. *K. suprenans* (Chamberlin).

18. *Loxosceles rufescens* Dufour

Scytodes rufescens Dufour, Ann. gen. sci. Phys., 1820, IV, p. 203, pl. 77, f. 5.

Localities: Angeles Bay, June 25, two; 10-15 miles north of Loreto, on trail to Mulegé, May 20, two; Mulegé, May 14, one; Puerto Escondido, May 29, one; San Pedro Bay, July 7, two; Puerto Ballandra, Carmen Island, May 21, two, one taken by V. Owen; Monserrate Island, May 24, one; Angel de la Guarda Island, May 6, one; Santa Cruz Island, June 11, one; North San Lorenzo Island, June 20, one young; South San Lorenzo Island, May 9, one female; San Esteban Island, April 19, two; Pond Island, June 30, two females; Isla Partida, April 22, two immature specimens.

A species widespread in Eurasia as well as in the northern half of the western hemisphere.

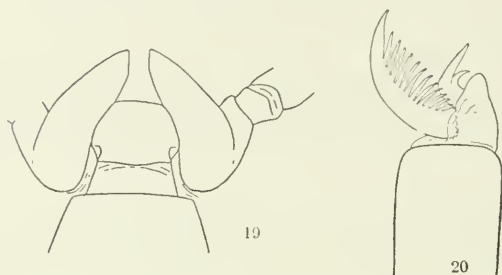
19. *Diguetia stridulans* Chamberlin, new speciesFig. 19. *Diguetia stridulans*, labium and endites.

Fig. 20. Distal end of tarsus of leg I of same, setæ omitted.

Female: Cephalothorax and legs with integument yellowish, clothed in life with white scales; abdomen with integument dusky, clothed also with white scales and long, aculeate setæ.

Cephalothorax rather narrow, much longer than wide. The furrows setting off the head meet behind in a transverse depression on the pars thoracica. Median eyes but slightly forward of the laterals, the ocular group being essentially transverse; separated from the laterals by about the diameter of an eye; lateral eyes separated from each other by less than their radius. Labium distinctly set off and laterally excavated toward base, the excision long but shallow (fig. 19).

Chelicerae on outer face striate, the femur of palpus bearing a series of tubercles opposite this striate area. Legs long and slender, bearing numerous long setæ which on the distal joints of the first pairs become more spinescent; paired claws typically with twelve teeth as shown in fig. 20; several types of plumose hairs accompany claws. On ventral side of abdomen the integument is leathery, almost scutelliform, in front of rima genitalis and also in front of spinnerets. Total length, 4.2 mm.; tib. + pat. I, 3.2 mm.

Type: Female, No. 1374, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 30, 1921, on Mejia Island, Gulf of California.

This species differs at sight from *D. canities* in having long, coarse setæ on the abdomen, in lacking bands on the legs, etc. The striæ on the external face of the chelicerae differ conspicuously from those in *canities*. In the latter the striæ are all exceedingly fine and close-set; but in *stridulans*, in addition to these fine striæ, there are much coarser ones at

intervals in the series which are visible even under the low power of the microscope.

20. *Diguetia dialectica* Chamberlin, new species

Female: In general appearance resembling *D. canities* McCook, but a smaller species with anterior legs relatively somewhat longer. Carapace less densely clothed with white hair but with two denser lines of white hair on pars cephalica uniting behind to form an elongate V-shaped mark. Sternum light in the middle, blackish at the sides, clothed with white hairs. Legs with the joints annulate with black at the ends as in *canities* but differing in that the median annulus of the tibiae is narrow, less deep, and is in all cases incomplete above. Abdomen less densely and less uniformly clothed with white hairs than in *canities*, a dark mark showing on basal part above and as far back as middle, the white hairs on it being sparse; behind this a light area with more numerous white hairs bordered on each side by a wavy line of denser white hair; integument of venter dark brown, less densely clothed with white hair than the sides.

Anterior row of eyes slightly recurved. Striae on external face of chelicerae exceedingly fine and close-set as in *canities*. Length, 5 mm.

Type: Female, No. 1375, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 23, 1921, at **Puerto Ballandra, Carmen Island, Gulf of California.**

21. *Diguetia canities* McCook

Segestia canities McCook, American Spiders, 1889, II, p. 136, f. 165, 166.

Locality: Espiritu Santo Island, June 1, two females.

Previously known from Texas, California and Lower California.

21a. *Scytodes fusca* Walckenaer

Ins. Apt., 1837, p. 272.

Localities: Guaymas, two females taken April 9 by E. P. Van Duzee and one female taken April 15 by J. C. Chamberlin; San Pedro Bay, July 7, two females; San Carlos Bay July 8, E. P. Van Duzee; Puerto Escondido, May 29, two females; Las Animas Bay, May 8, one female; J. C. Chamberlin and V. Owen; Loreto, May 19, one young female; Cuesta Blanca, on trail to Mulege, 10-15 miles north of Loreto, May 20, two females; Angeles Bay, May 5, one Concepcion Bay, June 17, two young; Coronados Island, May 18, one female; Patos Island, April 23, one female; Isla Partida, April 22, one female, E. P. Van Duzee; San Pedro Nolasco Island, April 17, one female; San Pedro Martir Island, April 17, one; Angel de la Guarda Island, May 3, two females; Granite

Island, May 2, two females; North San Lorenzo Island, June 24, one female; Ceralbo Island, June 6, three young; San Marcos Island, June 20, one young; Santa Catalina Island, June 12; Pelican Island, July 5, three females; Tiburon Island, July 5, three females.

A species ranging from Brazil northward to Mexico, the West Indies and the Bermudas.

22. *Scytodes redempta* Chamberlin, new species

Female: Carapace yellow, more whitish above, with complicated markings in black, in part as follows: median eyes enclosed in black from which three parallel lines run back on head, the median of these longest; a black line passing caudad over lateral eyes bifurcates behind eyes, the inner branch uniting with the lateral of the three median lines; behind outer branch on each side on pars thoracica a heavier black band or area reaching to or nearly to the caudal margin; a number of disconnected black marks on each side. Sternum yellowish-white with a black spot on border adjacent to each leg, the three anterior pairs of spots more or less connected by a line of weaker dots. Legs pale yellow; each coxa with a black dot at distal end beneath; femur I with two black rings on distal half, with closely arranged, rather irregular marks and spots proximad of these and reaching to base, these black marks less and less distinct and extensive in going from first to last legs; patella black at distal end; tibia with three black rings; metatarsus dusky or streaked with black. Abdomen pale yellow or yellowish-white; dorsum marked with a series of black chevrons, continued on each side below by long oblique black lines or series of black marks; venter pale, with a few black dots, especially in area adjacent to spinnerets.

Median eyes contiguous. Abdomen moderately high and rounded, longer than wide. Length, 5 mm.

Type: Female, No. 1376, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 22, 1921, on *Isla Partida*, Gulf of California. *Paratypes*, two females, in Mus. Calif. Acad. Sci. and M. C. Z., same data.

This species resembles *S. thoracica* in general appearance but may be easily distinguished by the difference in the characteristic black pattern of the carapace and the more diffuse black markings of the legs.

23. *Scytodes pnoëtens* Chamberlin, new species

Female: Carapace pale yellow; the dark markings of pars cephalica similar to those of *S. redempta* but with the median line absent or vaguely indicated only anteriorly; lines on pars cephalica not followed behind by the solid areas present in *redempta*, these at most represented by several small dots; markings

of sides weak and less numerous, typically a marginal line with three oblique marks rising from it on each side. Sternum yellow, without marks, or with an obscure dot opposite base of each leg. Legs light, with femora irregularly dusky but not definitely annulate; the tibiæ may also have the dark pigment diffuse or it may be condensed into the usual three annuli which, however, tend to be incomplete above; metatarsi dusky beneath. Abdomen grey, typically with a series of continuous black lines running transversely across dorsum and down the sides; venter pale.

Cephalothorax rather low, dorsally well rounded behind. Legs obviously shorter and weaker than in *S. redempta*. Median eyes contiguous. Abdomen short, rounded. Length, 3 mm.

Type: Female, No. 1377, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 12, 1921, on **San Marcos Island, Gulf of California**. *Paratypes*: three females, in Mus. Calif. Acad. Sci. and M. C. Z., same data.

Distinguishable from *S. thoracica* and *S. redempta* in smaller size, shorter and weaker legs and differences in details of color pattern.

OONOPIDÆ

24. *Scaphiella hespera* Chamberlin, new species

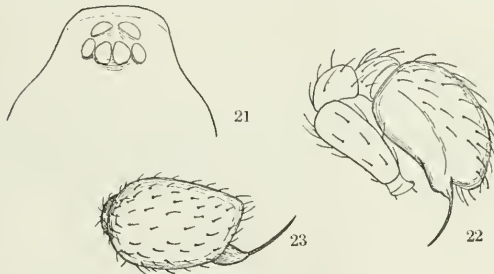


Fig. 21. *Scaphiella hespera*, eyes and head, dorsal view.

Fig. 22. Right palpus of male, ectal view.

Fig. 23. Tarsus of same, dorsal view.

Male: Carapace with a distinct, though dilute, reddish cast, abdomen above yellowish brown with no reddish tinge; abdomen paler beneath, the sternum also without any red. In some cases the carapace and abdomen are both of a somewhat dusky brown color, with no red. Hairs on both carapace and abdomen short and sparse. Dorsal scutum completely covering the abdomen above and the ventral scutum also extending close to spinnerets, its caudal margin incurved. Palpus as shown in figures 22 and 23. Length, 1.9 mm.

Type: Male, No. 1113, M. C. Z., taken by R. V. Chamberlin in March, 1913, on Santa Cruz Island, California. *Paratypes*: Same data as type, and one male taken by J. C. Chamberlin, June 13, 1921, on the larger of the Las Galeras Islands, Gulf of California, the latter in the collection of the California Academy of Sciences.

25. *Scaphiella litoris* Chamberlin, new species

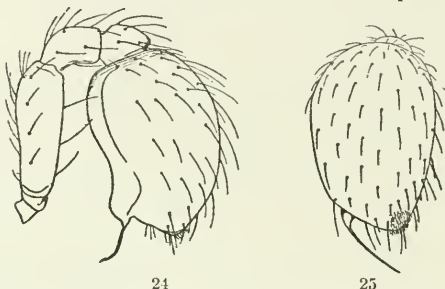


Fig. 24. *Scaphiella litoris*, right palpus of male, extal view, enlargement same as for figures 22 and 23.

Fig. 25. Tarsus of same, dorsal view.

Male: Cephalothorax and abdomen dusky yellow-brown, legs clear yellow-brown. Posterior row of eyes straight, the eyes contiguous, the medians decidedly larger than the laterals as usual. Anterior median eyes scarcely differing in size from the posterior medians. Dorsal scutum completely covering the abdomen above as usual, the ventral scutum extending caudad quite to the base of the spinnerets. In the male palpus the enlargement at base of the embolus is obviously smaller than in *S. hespera* (figs. 24 and 25). Length, 2.25 mm.

Female: In what is presumably the female of this species the coloration is essentially as in the male in cephalothorax, legs and the large scutum; the soft integument along the dorsum whitish. Posterior row of eyes somewhat procurved, the anterior medians a little larger than the posterior medians. Ventral scutum of abdomen alone present. It covers also the sides and bends in some over the dorsum. Caudal margin below deeply concave, bending caudad on the sides where the caudal margin is convex. Length, 2.8 mm.

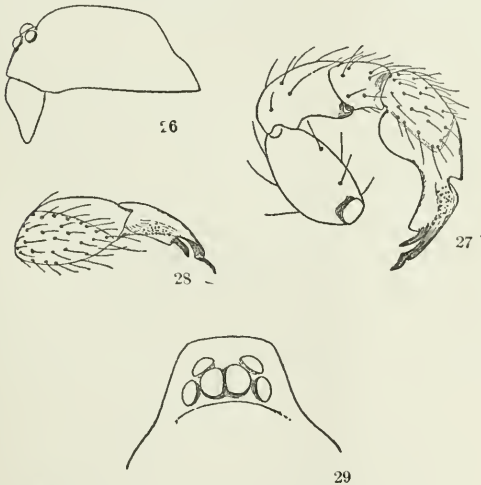
Type: Male, No. 1378, and *allotype*, female, No. 1379, Mus. Calif. Acad. Sci., taken by J. C. Chamberlin, June 14, 1921, under stones in a grove of palo verde and mesquite at mouth of a gorge, at Puerto Escondido, Lower California. *Paratypes*: San Marcos Island and Angeles Bay, Lower California, in Mus. Calif. Acad. Sci. and M. C. Z.

Yumates Chamberlin, new genus

Cephalothorax rising abruptly just behind eyes, dorsal line then nearly of uniform height to beginning of posterior declivity, which is steep. Clypeus much higher than the diameter of an eye. Posterior row of eyes decidedly procurved. Posterior median eyes contiguous, narrowly separated from laterals. Anterior eyes widely separated. Posterior median eyes near middle of eye group, much as in *Oonops*. Sternum, truncate between posterior coxæ. Abdomen broadly elliptic in outline as viewed from above, completely covered above by a chitinous plate, an entire ventral scutum also extending close to the spinnerets at base of which is a narrow chitinous band or inframmillary scutum as in *Gamasomorpha*; a chitinous ring or sheath about abdominal end of pedicel. Coxæ of legs moderately elongate, not globose. Tarsi much shorter than the metatarsi. Palpal organ of male with a supplementary spine below the principal spine or embolus.

Genotype—*Yumates nesophila*, new species.

26. *Yumates nesophila* Chamberlin, new species



- Fig. 26. *Yumates nesophila*, cephalothorax in outline, lateral view.
 Fig. 27. Left palpus of male, mesal view.
 Fig. 28. Tarsus of same, subdorsal view.
 Fig. 29. Eyes dorsal view.

Male: Cephalothorax and plates of abdomen yellowish-brown of a slightly reddish cast, or the red may be missing from the abdomen, or from both abdomen and cephalothorax. Carapace usually a little dusky, especially on the sides. Legs clear yellow. Carapace in profile rather abruptly elevated just behind the posterior eyes, the dorsal line convex, as high anteriorly as posteriorly adjacent to the posterior declivity (fig. 26). Posterior row of eyes conspicuously recurved; median eyes contiguous with each other and only narrowly separated from the laterals, which are smaller. Anterior eyes separated from the posterior laterals and the posterior medians by less than their radius, about equal in size to the posterior laterals. Abdomen with the usual dorsal and ventral plates and the narrow chitinous band at base of spinnerets. In the tarsus of the palpus there is a number of black points or prickles on the mesal side of the base of the distal or embolic division. For other details see figs. 27 and 28. Length, 2 mm.

Female: In coloration and general appearance similar to male excepting for the little larger size.

Type: Male, No. 1380, and *allotype*, female, No. 1381, Mus. Calif. Acad. Sci., taken by J. C. Chamberlin, May 21, 1921, in Fig Cañon, Puerto Ballandra, Carmen Island, Gulf of California. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z.; Puerto Ballandra, Carmen Island, May 21, one male; San Marcos Island, May 12, six specimens, males and females, taken under stones at mouth of a cañon; La Paz, April 11, 1921, one female.

27. *Yumates angela* Chamberlin, new species



30

Fig. 30. *Yumates angela*, left palpus of male, mesal view.

Male: Cephalothorax and scuta of abdomen dusky brown, the cephalothorax somewhat lighter from the presence of a little red. Legs clear yellowish brown. Form of cephalothorax essentially as in preceding species, the eyes

also nearly identical in arrangement and proportions excepting that the anterior eyes are somewhat larger relatively to the posterior. Scuta of abdomen as in *nesophila*.

The species is obviously different from *nesophila* in various details of the palpal organ. Thus it quite lacks the spinules or prickles on the mesal side of the base of the embolic division and also the conspicuous angle below the base of the spur, and the embolus differs in form (fig. 30). Length, 2 mm.

Type: Male, No. 1382, Mus. Calif. Acad. Sci., taken by J. C. Chamberlin, June 30, 1921, on sand spit opposite Pond Island, Angel de la Guarda Island, Gulf of California.

CAPONIIDÆ

The presence in the collections of the expedition of specimens representing three new genera in this interesting family is especially noteworthy. The known genera of the family may now be tabulated as follows:

Key to Genera of Caponiidæ

- a₁. Anterior metatarsi bearing a translucent keel along its ventral line and the tarsus with a translucent apophysis at base.
 - b₁. Anterior tarsi with paired translucent lamina below paired claws and replacing the unpaired claw. *Nops* McLeay.
 - b₂. Anterior tarsi with unpaired claw present, no such paired lamina.
 - c₁. Cephalothorax ovate; a distinct false suture dividing anterior tarsus into two principal segments of which the distal is much shorter, as in *Nops* *Orthonops* new genus.
 - c₂. Cephalothorax broader, subrotund, and more depressed; anterior tarsi with several false sutures of which the most distinct is toward the proximal end. *Tarsonops* new genus.
- a₂. Anterior metatarsi bearing no such ventral keel and the tarsus with no such apophysis at base.
 - b₁. Eyes two. *Caponina* Simon.
 - b₂. Eyes four or eight.
 - c₁. Eyes four; anterior tarsi with a false suture. *Nopsides* new genus.
 - c₂. Eyes eight; anterior tarsi with no false suture. *Caponia* Simon.

Orthonops Chamberlin, new genus

A genus agreeing essentially with *Nops* excepting that the anterior tarsi have an inferior claw strongly developed, and wholly lack the paired membranous laminae of the latter genus.

Genotype: *Orthonops oertus* new species.

28. *Orthonops overtus* Chamberlin, new species

Female: Carapace and sternum pale chestnut, the eyes narrowly bordered with black. Legs clear yellow. Abdomen dark grey.

Eyes less than their radius apart, their black bases confluent as in species of *Nops*. Tarsus of anterior legs narrow at base, strongly enlarged distad; membranous appendage at base slender; median claw well developed, geniculate; paired claws strongly curved, bearing five long teeth.

Length, 8 mm.

Type: Female, No. 1383, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 28, 1921, on San Luis Island, Gulf of California. One female taken under a stone near the beach.

Tarsonops Chamberlin, new genus

Differing from *Nops* in having the cephalothorax broad, almost subcircular instead of more narrowly ovate and in having the labium relatively broader. It also differs in lacking membranous laminae below claws of anterior tarsi and in having these tarsi divided by several pale lines or false sutures, which may be incomplete, instead of by a single false suture. Of these lines the most proximal in the known species is best developed and sets off a distinct basal division. The metatarsus of the anterior legs is more or less curved and also exhibits a number of pale cross lines. Paired claws of anterior tarsi with six or seven long teeth. Tarsus of palpus of female not stouter than the tibia.

Genotype: *Tarsonops sectipes* new species.

Includes also *Nops sternalis* Banks, the types of which came from San José del Cabo, Lower California, and the other new species described below.

Key to Species of Tarsonops

- a₁. Length of femur I (measured along ventral edge) more than 3.5 times the greatest thickness (dorsoventral).
 - b₁. Femur I 3.9 times longer than thick, only moderately narrowed distad (fig. 37); false sutures on middle and distal part of anterior tarsus three, the same number on metatarsus; length of body, 3 mm. *T. systematicus* new species.
 - b₂. Femur I about 3.6 times longer than thick, more strongly narrowed distad (fig. 35); false sutures on tarsus and metatarsus more numerous; length of body, 5 mm. *T. sternalis* (Banks.)
- a₂. Length of femur I only three times the greatest thickness.
 - b₁. Tarsus I conspicuously clavate, with only a single false intercalary joint or article at middle, the metatarsus also with but one (fig. 36). *T. clavis* new species.
 - b₂. Tarsus not at all, or but slightly clavate, obviously longer in proportion to width; both tarsus and metatarsus with several false intercalary articles (fig. 34). *T. sectipes* new species.

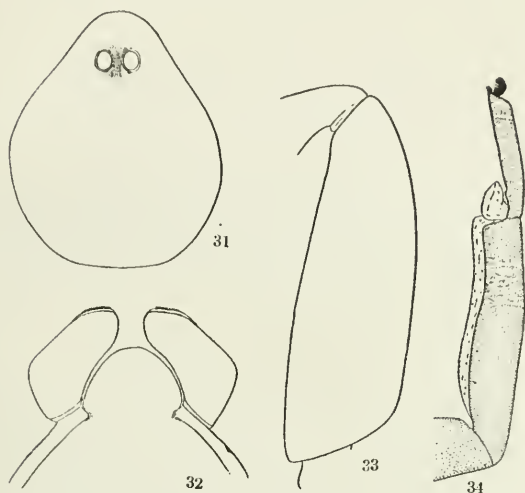
29. *Tarsonops sectipes* Chamberlin, new species

Fig. 31. *Tarsonops sectipes*, cephalothorax in outline, dorsal view.

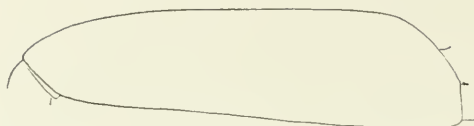
Fig. 32. Labium and endites.

Fig. 33. Femur of leg I in outline.

Fig. 34. Metatarsus and tarsus, setae omitted, same magnification as for figure 33.

Female: Cephalothorax and legs clear yellow. Abdomen grey. Cephalothorax proportionately broad, strongly narrowed forward but with the head not quite so abruptly set off as it is in *T. sternalis*. Eyes large, close together, (fig. 31). Labium and endites as shown in figure 32. Sternum more strongly narrowed caudad than cephalad.

Anterior legs proportionately shorter than in *sternalis*. The ratio of length to greatest thickness in metatarsus I is 5.5 to 1, whereas the corresponding ratio in *sternalis* is 7 to 1. The ratio of length to greatest thickness in femur I is 3 to 1 whereas in *sternalis* it is 3.6 to 1. The length of the tarsus in leg I of the present species equals, or but slightly exceeds, the greatest thickness of the femur, whereas it plainly exceeds this (7.5) in the type of *sternalis*. The superior claws of tarsus I have six teeth as against seven in *sternalis*. The unpaired claw has three teeth below. Length, 4.2 mm.

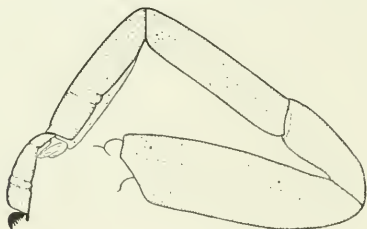


35

Fig. 35. *Tarsonops sternalis*, femur I in outline, same magnification as for figure 33.

Type: Female, No. 1384, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 7, 1921, on **Ceralbo Island, Gulf of California**. Two females taken at Rufo's ranch-house on west coast of the island. *Paratype* in M. C. Z., same data.

30. *Tarsonops clavis* Chamberlin, new species



36

Fig. 36. *Tarsonops clavis*, first leg, setae omitted.

Female: Coloration in general as in *sectipes*, the cephalothorax and legs being yellow and the abdomen grey. Form of the cephalothorax, labium and endites and the relations of eyes as in *sectipes*.

This species is most readily distinguished by the characters of the legs which at once appear different from the preceding species because of the more slender femora and the more clavate tarsus of the anterior legs. The tarsus shows but one pseudosegment near middle instead of several and the metatarsus shows a similar but less clearly indicated one (fig. 36). The paired claws of the anterior legs have seven long teeth instead of but six; the unpaired claw is rather smaller. Length, 3 mm.

Type: Female, No. 1385, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 8, 1921, at **Concepcion Bay, Lower California**.

31. *Tarsonops systematicus* Chamberlin, new species

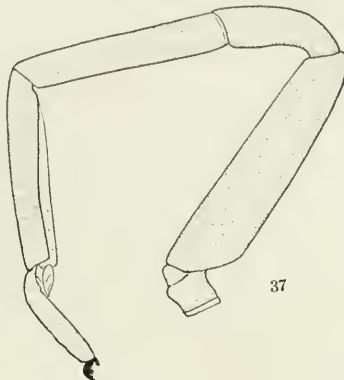


Fig. 37. *Tarsonops systematicus*, leg I.

Female: General coloration of body and general form of cephalothorax, labium and endites as in the two preceding species.

Fourth legs long and slender, much exceeding in length the first pair. The latter furnish convenient distinguishing characteristics; the paired claws bear eight long teeth of which the more basal ones are crowded; the unpaired claw apparently bears only a single tooth beneath; the tarsus in middle and distal portion shows three clearer bands or false sutures which are unusually wide, and the usual more pronounced subbasal one is present; in the metatarsus there are two similarly wide clear bands one of which in the type is partially divided below as shown in fig. 37. Length, 3 mm.

Type: Female, No. 1386, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, July 7, 1921, at **San Pedro Bay, Sonora.**

Nopsides Chamberlin, new genus

Cephalothorax ovate, narrowing evenly forward, the anterior end obtuse. Characterized by having four eyes, of which two are dark in color and have a more strongly convex lens and correspond in position with the two present in *Nops*. The other two eyes are in front of these and are pale, with the lenses flat. Endites broad distally, with the distomesal angles produced inward and nearly meeting over the apex of the labium. Tarsus of male palpus enlarged as in *Nops*. Upper margin of furrow of chelicera with a membranous appendage along most of length, the upper margin with a shorter one toward claw.

Sternum broadly elliptic in outline. Tarsi of all legs with a false suture as in *Nops*. The metatarsus without keel below and the first tarsal division without membranous appendage. Paired claws of anterior legs with four long teeth, those of the posterior legs with five. Unpaired claw absent or aborted, over it a membranous sheath, open along ventral edge and in lateral view appearing laminiform.

Genotype: *Nopsides ceralbona* new species.

32. *Nopsides ceralbona* Chamberlin, new species

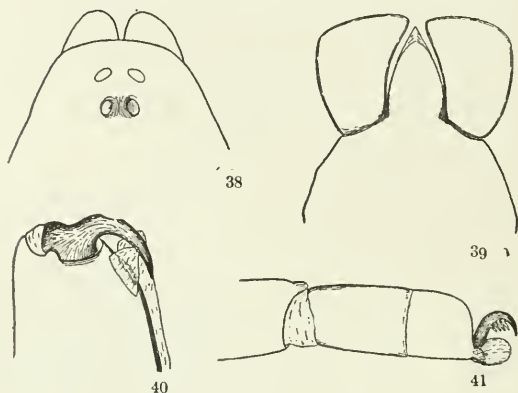


Fig. 38. *Nopsides ceralbona*, anterior end of cephalothorax showing eyes, dorsal view.

Fig. 39. Labium, endites and anterior portion of sternum in outline.

Fig. 40. Distal portion of chelicera, lower side, setae omitted.

Fig. 41. Tarsus of leg I, anterior view, setae omitted.

Female: Carapace and sternum yellowish-red or very dilute chestnut, the hairs sparse. Legs clearer yellow, clothed with numerous long hairs. Abdomen above dark grey, lighter beneath, densely clothed with hair.

Posterior eyes with the black basal tubercles contiguous, but the lenses well separated. Anterior eyes pale and not strongly developed, less than their diameter apart, the line between their outer edges longer than the line covered by the posterior eyes. Labium and endites as shown in fig. 39; the claw of chelicerae thickened at base. See also fig. 40. Leg IV longer than I but the latter stouter. Anterior coxae much longer than the posterior, with coxa IV longer than III. Paired claws and median sheath as shown in fig. 41.

Length, 8 mm. Length of cephalothorax, 4.2 mm.

Type: Female, No. 1387, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 7, 1921, on **Ceralbo Island, Gulf of California**. Three not fully mature specimens taken. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z., same data.

DYSDERIDÆ

33. *Segestria danzantica* Chamberlin, new species

Female: Carapace dusky, deeper in color behind head. Sternum dusky over yellow. Abdomen greyish, no distinct color pattern traceable in the type in its present condition. Legs yellow, with a black band at distal end of femur, one embracing patella, and two on tibia, one of the latter being at distal end and one just proximad of middle.

Cephalothorax low, with the head proportionately broad. Anterior row of eyes recurved. Median eyes longest, contiguous, separated from laterals by a little more than their diameter. Length, 3.2 mm.

Type: Female, No. 1388, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 24, 1921, on **Danzante Island, Gulf of California**.

May be distinguished from *S. pacifica* in lacking true spines on the legs, in the moderately recurved anterior eye row, and in lacking the two black bands on the metatarsi.

Genus *Ariadna*

Three new species of this genus were represented in the collection. These may be separated from each other and from the two species previously known from the Gulf of California region by means of the following table.

Key to Species of Ariadna of the Gulf of California Region

FEMALES

- a₁. Median eyes separated from the posterior laterals by once and two-thirds their diameter or more; cephalothorax 4.8-6 mm. long.
- b₁. Metatarsus III with three single ventral spines proximad of the pair at distal end; tibia III with two ventral spines; median eyes once and two-thirds their diameter from laterals. *A. philosopha* new species.
- b₂. Metatarsus III with two single ventral spines proximad of distal pair; tibia III with three ventral spines; median eyes twice their diameter from laterals. *A. scholastica* new species.

- a₂. Median eyes separated from the laterals by only once and a fourth their diameter or less; cephalothorax only 4 mm. or less in length.
- b₁. Tibia II with a spine on anterior face near middle and with only one ventral spine under anterior border. *A. pragmatica* new species.
- b₂. Tibia II with no spine on anterior face; usually with two ventral spines under anterior border.
- c₁. Tibia III normally with only a single ventral spine.
 *A. mexicana* Banks.
- c₂. Tibia III normally with two or three ventral spines, only sporadic specimens with but one. *A. bicolor* (Hentz)

34. *Ariadna bicolor* Hentz

Pylarus bicolor Hentz, Jour. Bost. Soc. Nat. Hist., 1842, IV, p. 225, pl. 8, figs. 3, 4.

Pylarus pumilis Hentz, *ibid.* p. 226, pl. 8, fig. 5.

Ariadna bicolor Emerton, Trans. Conn. Acad. Sci., 1889, VIII, p. 201, pl. 8, fig. 3.

Ariadna rubella Keyserling, Verh. zool. bot. Ges. Wien, 1877, XXVII, p. 229.

Only females are represented in the collections of the expedition, making it difficult in many cases to be sure that all specimens here listed really belong to one species. However, they cannot be separated from the forms of *A. bicolor* occurring in the southern United States on the basis of any characters thus far indicated.

In females of *A. bicolor* the median eyes are separated from the posterior laterals by a distance from once and a fourth to seven eighths their diameter. The distance of separation of these eyes in all the specimens here listed lies between these limits. In regard to *A. mexicana*, from Chuparosa, Lower California, Mr. Banks states: "The median eyes are much more than their diameter (farther than in *A. bicolor*) from the slightly larger side eyes." However, micrometer measurements of the two existing types now in the M. C. Z. collection, shows the distance to be only once and a fourth the diameter of a median eye, the same as in many specimens of *bicolor*.

The ventral spines of leg III in *bicolor* in most cases are two in number, one distad of and one proximad of middle, with the latter somewhat shorter. However, an additional spine is occasionally present at distal end and, in addition,

one may occur at proximal end. On the other hand, there may be only one spine present, as appears to be usual when a leg is regenerated. I have seen sporadic specimens of *bicolor*, in which only a single spine is present on both sides, from Massachusetts, New York, Indiana and North Carolina. Since, however, only a single spine is present on tibia II on both sides of both specimens of *A. mexicana*, this number is probably normal in that form.

In view of the fact that the specimens are too few to indicate the range of variations and that most of those noted can be matched in individual specimens of *bicolor*, it seems best merely to indicate the variations noted as follows.

FORM A

Median eyes separated from laterals by their diameter or slightly more. Tibia II with one pair of ventral spines at distal end and in addition three single spines under the posterior border; tibia III with three seriate spines below, of these the most proximal is well removed from the base.

Length, 7 mm.; cephalothorax, 3.5 mm., tibia + patella IV, 3 mm.; tibia + patella I, 2.9 mm.

Locality: Guaymas, April 15, one female.

FORM B.

Median eyes separated from laterals by their diameter or less (seven-eighths). Tibia II with two pairs of ventral spines and two single ones behind these under the caudal border; tibia III with two ventral spines, one distad of middle and one proximad of it; metatarsus and tarsus of leg I dark, but not so the tibia.

Length, 7.2 mm.; cephalothorax, 3.2 mm.; tibia + patella IV, 2.8 mm.; tibia + patella I, 2.25 mm.

Localities: Santa Catalina Island, June 12, two females, taken by E. P. Van Duzee; Ildefonso Island, May 17, one female.

FORM C.

Median eyes their diameter from the laterals. Right tibia I in the single specimen with a spine on anterior side which is lacking on the left leg; tibia II with two pairs of ventral spines and in addition with two single ones under caudal border; tibia III with three seriate ventral spines, the proximal one nearer to base than to median spine.

Length, 8 mm.; cephalothorax, 3.8 mm.; tibia + patella IV, 3 mm.

Locality. Tortuga Island, June 22, one female.

FORM D.

Median eyes once and a fourth their diameter from the laterals. Tibia II with two pairs of ventral spines and two single additional ones under the posterior border; tibia III with two seriate spines beneath or with a small third one at distal end. First legs darkened only distad of patella.

Length, 10 mm.; cephalothorax, 4 mm.; tibia + patella IV, 3.5 mm.; tibia + patella I, 3.25 mm.

Localities: San Diego Island, May 27, two females; Santa Cruz Island, May 27, one female.

The typical form of this species is widespread in the eastern and southeastern sections of the United States.

35. *Ariadna pragmatica* Chamberlin, new species

Female: Carapace chestnut, in part dusky; sternum chestnut, darker at the sides; legs yellowish, the first pair darkened; abdomen purplish grey or brownish above, grey laterally and beneath.

Median eyes forming a straight series, with the posterior laterals; separated from the latter by once and a fourth their diameter. Spines of leg I as usual. Tibia II with a pair of ventral spines at distal end and three seriate spines in addition under the posterior border, tibia II also with a small spine near middle on anterior side; right tibia III in type with four ventral spines, the left, which is apparently regenerated, with only one. Metatarsus II with a pair and two single ventral spines as usual. Length, 7.5 mm.; cephalothorax, 3.6 mm.; tibia + patella IV, 3.2 mm.; tibia + patella I, 3 mm.

Type: Female, No. 1389, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 25, 1921, at Tepoca Bay, Sonora.

36. *Ariadna philosopha* Chamberlin, new species

Female: The carapace varies from yellowish-brown to mahogany or nearly black in older individuals; sternum from yellow to chestnut with sides typically blacker, leaving a light median longitudinal stripe; legs from yellow to light brown with the first two pairs darker, the first pair often nearly black, the hairs of these legs on tibia and metatarsus longer and rather denser. Abdomen purplish brown.

Median eyes circular, contiguous, and forming with the posterior median eyes a slightly recurved row, decidedly farther from the laterals than in *bicolor*, the distance being typically close to once and two-thirds their diameter. Tibia I with four pairs of spines beneath, metatarsus with seven or eight pairs; tibia II with two spines under anterior border, four under the posterior; tibia III with two seriate spines beneath and metatarsus III with three seriate spines and a pair at distal end beneath. Length, up to 15 mm.; cephalothorax, 6 mm.; tibia + patella IV, 5 mm.; tibia + patella I, 4.5 mm.

Type: Female, No. 1390, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 22, 1921, on Isla Partida, Gulf of California. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z., five females taken "in tubular, thickly woven webs in decaying *Cereus*" with the type.

This species differs from *A. bicolor* in the decidedly greater separation of the lateral eyes from the medians. It differs from *A. mexicana* in having tibia III armed below with two seriate spines instead of but one, and in having metatarsus II armed below with three spines proximad of the distal pair instead of but two.

37. *Ariadna scholastica* Chamberlin, new species

Female: Carapace chestnut, darkened in head region; sternum chestnut in middle, blackish over sides; legs brown, those of the first pair darkened distad of the coxæ. Abdomen purplish brown both above and below.

Posterior median eyes forming a recurved row with the posterior laterals, usually touching each other at one point but not pressed together, separated from the laterals by about twice their diameter. Spines of first legs as usual. Tibia III with three spines beneath, one near base, one proximad of middle, and one smaller one at distal end; metatarsus III with two seriate spines proximad of the pair at the distal end. Length, 11 mm.; cephalothorax, 4.8 mm.; tibia + patella IV, 4 mm.

Type: Female, No. 1391, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 23, 1921, on Patos Island, Gulf of California.

Citharoceps Chamberlin, new genus

Median eyes forming a recurved line with the posterior laterals. Clypeus not exceeding the diameter of an eye. Claw of chelicera short; lower margin of furrow unarmed, the upper margin with three teeth not differing much in size. Anterior legs more robust than the posterior, the tibiæ and metatarsi strongly spined beneath. Each side of pars cephalica strongly vertically striate. Femur of leg 8 with some small tubercles on the anterior (inner) face toward base.

Genotype: *Citharoceps fidicina* new species.

This genus agrees in general with *Ariadna* excepting in the possession of the stridulating apparatus in the character of which it is unique.

38. *Citharoceps fidicina* Chamberlin, new species

Female: Carapace yellowish-brown; sternum and legs yellow; abdomen somewhat greyish-brown, darker, more blackish, along median dorsal line, paler beneath.

Clypeus low, about equal to the diameter of an anterior lateral eye. Median eyes contiguous, their diameter, or slightly more, from the posterior laterals with which they form a distinctly recurved line; lateral eyes on each side contiguous. Striæ on sides of head very distinct, the band extending back to pars thoracica, the striæ becoming shorter and finer toward caudal end of series. Tibia I with four pairs of spines beneath and metatarsus I also with four pairs beneath; the fourth legs wholly lack spines excepting that at distal end of the tibia, beneath there are two or three setiform spines contiguous with each other at the base. Length, 6 mm.

Type: Female, No. 1392, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 7, 1921, at **Ensenada, Lower California**. *Paratype* in M. C. Z., same data.

PRODIDOMIDÆ

This is a small and apparently primitive family of variously appreciated affinities. The material from the islands of the Gulf of California embraces representatives of a new genus which may be distinguished from the previously known genera by means of the following key.

Key to Genera of Prodidomidæ

- a₁. Upper spinnerets much stouter than the inferior.
 - b₁. Upper spinnerets long and cylindrical. *Eleleis* Simon.
 - b₂. Upper spinnerets short, the basal article oblique at end and the apical article compressed and ovate. *Prodidomus* Hentz.
- a₂. Upper spinnerets much smaller and more slender than the inferior.
 - b₁. Lower spinnerets remote from the others and widely separated from each other; apical article of upper spinnerets small and acuminate. *Zimiris* Simon
 - b₂. Lower spinnerets close to the others and contiguous with each other or nearly so. *Pericuris* new genus.

Pericuris Chamberlin, new genus

Stria of thorax slight. Eyes of the usual general conformation; anterior median eyes somewhat smaller than the laterals, narrowly separated from each other, contiguous with the laterals; anterior and the posterior laterals and the posterior median of each side typically contiguous, the posterior medians distinctly separated from each other. Sternum broadly elliptic.

Trochanter of legs elongate, subequal to coxa. Characterized in having the lower spinnerets proportionately thick, contiguous with each other, and bearing long, penicillate tubules. Upper spinnerets very small in comparison, with the second joint short.

Genotype: *Pericuris insularis* new species.

39. *Pericuris insularis* Chamberlin, new species

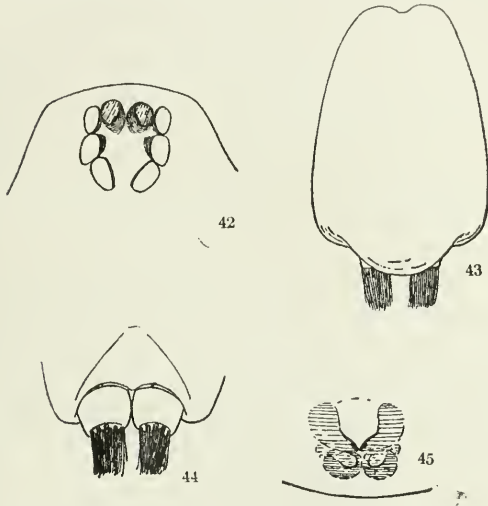


Fig. 42. *Pericuris insularis*, eyes of paratype from Ceralbo Island.

Fig. 43. Abdomen of same in outline, dorsal view.

Fig. 44. Spinnerets of same.

Fig. 45. Epigynum of holotype from Ballena Island.

Female: Cephalothorax and legs light yellow; abdomen light grey, densely clothed with appressed hair.

Eye area slightly wider than long (about as 12:11); anterior row of eyes as seen from above a little recurved; anterior median eyes circular, with their black bases contiguous, the lenses proper separated from each other by about their radius; the other eyes forming a V-shaped outline, with the angle open behind, the three on each side being contiguous but the posterior medians distinctly separated from each other, subelliptic in outline (fig. 42).

Tarsus of palpus about equal in length to the metatarsus, somewhat clavately enlarged from base distad; tarsus of anterior legs shorter than the metatarsus, narrowed at distal end; anterior legs without spines; third legs with tibiae and metatarsi strongly spined below and laterally. Fourth legs missing from holotype. Abdomen oblong in outline as seen from above, a little wider behind than in front; spinnerets thicker than long, contiguous, bearing numerous long tubules which exceed the spinneret in length (fig. 44). Length, 4 mm.

Type: Female, No. 1393, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 9, 1921, on **Ballena Island, Gulf of California**. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z., Ceralbo Island, June 7, 1921, one immature individual collected on west coast at "Rufo's ranch-house"; San Esteban Island, April 19, 1921, one female.

GNAPHOSIDÆ

40. *Herpyllus validus* (Banks)

Prothesima valida Banks, Trans. Amer. Ent. Soc., 1893, XXIII, page 62.

Herpyllus validus Banks, Proc. Cal. Acad. Sci., 1904, ser. 3, III, p. 337, pl. 39, figs. 25, 29.

Localities: Nogales, Arizona, April 4, four females collected by E. P. Van Duzee; San Pedro Martir Island, April 19, one adult and two immature females.

This species was previously known only from California.

41. *Sergiolus atomisticus* Chamberlin, new species

46

Fig. 46. *Sergiolus atomisticus*, epigynum.

Female: Carpace, sternum and legs dark mahogany colored; abdomen dark, with a white mark at base, wide anteriorly and furcate posteriorly, and

a white transverse mark in front of the spinnerets; somewhat paler in the mid-ventral region.

Posterior row of eyes only slightly recurved, its eyes essentially equal in size; anterior lateral eyes much larger than the posterior laterals, their diameters comparing nearly as 7:5; those on each side separated by a distance fully equal to the diameter of the former; anterior median eyes equal to the posterior laterals; separated from each other by their radius; area of median eyes wider behind than in front. Lower margin of furrow of chelicera wholly unarmed. Metatarsus I and metatarsus II each with a single ventral spine at base. Tibiæ I and II with two seriate spines under the anterior border; tibia II with a median dorsal spine. Epigynum, fig. 46.

Length, 6.2 mm.

Type: Female, No. 1394, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, in the **Gulf of California Region**, the precise locality not certain but possibly Espiritu Santo Island.

Related to *S. stella* Chamberlin of Texas in spining of legs and arrangement of eyes, but very different in the form of the epigynum.

Pœcilochroa sp.

An immature specimen of uncertain species.

Locality: Agua Verde Bay, May 26.

Genus **Nodocion** Chamberlin

Representatives of this genus have thus far been found only in California and the region represented by the present collection. The known species may be separated as follows.

Key to Species of Nodocion

- a₁. Tibiæ I and II with no spines.
 - b₁. Anterior median eyes smaller than the laterals; metatarsus I with one or two spines at base.
 - c₁. Anterior median eyes two-thirds the diameter of the laterals, their diameter apart. *N. iugans* Chamberlin (♂)
 - c₂. Anterior median eyes five-sixths the diameter of the laterals, less than their radius apart. *N. barbaranus* Chamberlin
 - b₂. Anterior median eyes as large as the laterals; metatarsus I with no spine at base. *N. syntheticus* new species.
- a₂. Tibiæ I and II with one or more ventral spines; (anterior median eyes as large as or larger than the laterals.)
 - b₁. Both tibia III and tibia IV without a median dorsal spine; area of median eyes as wide behind as in front. *N. mateonus* Chamberlin.

- b₂. Tibia III, or both tibia III and tibia IV with a median dorsal spine at base; area of median eyes wider in front than behind.
- c₁. Both tibia III and tibia IV with a median dorsal spine; posterior median eyes decidedly farther from the laterals than from each other. *N. realisticus* new species.
- c₂. Tibia IV with no median dorsal spine; posterior median eyes rather nearer to the laterals than to each other.
- d₁. Anterior median eyes much larger than the laterals (their respective diameters to each other as 8:5); tibia I with three spines and II with four spines beneath. *N. eclecticus* new species.
- d₂. Anterior median eyes but little larger than the laterals; tibiae I and II with two seriate ventral spines. *N. pragmaticus* new species.

42. *Nodocion pragmaticus* Chamberlin, new species



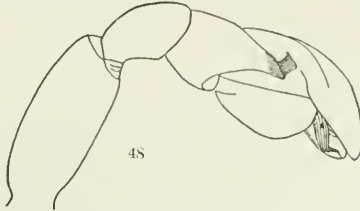
47

Fig. 47. *Nodocion pragmaticus*, epigynum, probably not quite mature.

Female: Carapace brown, the sternum and legs with more yellow; abdomen grey.

Posterior row of eyes slightly procurved; medians a little oblique, nearly two-thirds their longer diameter apart, a little nearer to the somewhat smaller lateral eyes; anterior median eyes somewhat less than their radius apart, slightly larger than the laterals; area of median eyes decidedly wider in front than behind (nearly 11:9); of same width in front as the length or very near it. Upper margin of furrow of chelicera with a low, rounded elevation but with no true teeth, the lower margin unarmed as usual. Metatarsus I with one spine at base; metatarsus II with two spines at base. Tibiae I and II with two seriate spines under the anterior border, one of these submedian and the other apical; Tibia III with a median dorsal spine, tibia IV with none. Epigynum (probably not quite mature), fig. 47. Length, 8 mm.

Type: Female, No. 1395, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 3, 1921, at Palm Cañon, Angel de la Guarda Island, Gulf of California. *Paratype*: San Pedro Nolasco Island, April 17, 1921, one immature female, probably of this species.

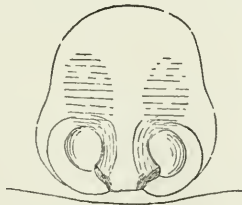
43. *Nodocion eclecticus* Chamberlin, new speciesFig. 48. *Nodocion eclecticus*, right palpus of male, ectal view.

Male: Carapace and legs light brown; abdomen dark grey with a reddish brown mark at base above.

Posterior row of eyes nearly straight; median eyes somewhat angled, about four-sevenths their diameter apart, a little nearer to the laterals; anterior median eyes a little more than their radius apart, much larger than the laterals (diameters about 8:5); area of median eyes wider in front than behind (19:17) and equal in length and width.

Furrow of chelicera unarmed either along upper or along lower margin. Tibia I with three spines beneath, a pair at distal end and a single one toward middle; tibia II with two pairs of spines beneath, and metatarsus II with a single pair at base; tibia III with a single dorsal spine at base, this a little to one side of the median line; tibia IV with no median dorsal spine. Palpus, fig. 48. Length, 5.2 mm.

Type: Male, No. 1396, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 14, 1921, at Guaymas, Sonora. One male taken under bark of mesquite.

44. *Nodocion realisticus* Chamberlin, new speciesFig. 49. *Nodocion realisticus*, epigynum.

Female: Cephalothorax and legs pale chestnut; abdomen grey; spinnerets yellow.

Posterior row of eyes a little procurved; medians oblique, about their radius apart, more than their diameter from the laterals which are slightly less in diameter (8:9); anterior median eyes their radius from each other, their diameter a little larger than that of the laterals (9:8); area of median eyes wider in front than behind (10:9) and longer than wide in front (23:20).

Upper margin of furrow of chelicera with a moderately large tooth forming an angle, the lower margin wholly unarmed. Metatarsi I and II with a single spine at base beneath; tibiae I and II with two seriate spines beneath under the anterior border, one being at distal end and one near middle; tibiae III and IV with a median dorsal spine at base. Epigynum, fig. 49. Length, 9 mm.

Type: Female, No. 1397, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 14, 1921, at Mulegé, Lower California. *Paratypes:* San Josef Island, June 10, 1921, a freshly moulted female, apparently the same species though smaller than the type and with eyes and carapace in present condition somewhat variant.

45. *Nodocion syntheticus* Chamberlin, new species

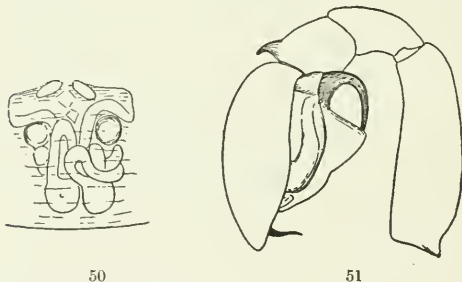


Fig. 50. *Nodocion syntheticus*, epigynum.

Fig. 51. Left palp of male, ectal view.

Female: Carapace, sternum and legs yellowish or brownish-yellow; abdomen light grey, without markings.

Posterior row of eyes a little procurved; the median eyes large and oblique only one-fourth, or less, their longer diameter apart and about an equal distance from the laterals; anterior median eyes equal in size to the laterals, separated from each other by nearly their radius; lateral eyes on each side their radius or less apart.

Lower margin of furrow of chelicera wholly smooth, the upper margin with two small but distinct teeth. Metatarsus I unarmed; metatarsus II with a pair of spines at base. Tibia I and II wholly unarmed; tibia III and IV with a median dorsal spine at base. Epigynum, fig. 50. Length, 3.5 mm.

Male: Palpus as shown in fig. 51. Length, 3.5 mm.

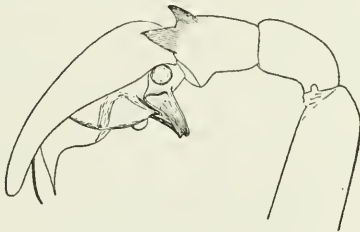
Type: Female, No. 1398, and *allotype*, male, No. 1399, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 21, 1921, on **Isla Raza, Gulf of California**, under stones. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z., five females same data as types.

Nodocion sp.

Young specimens which cannot be placed in their species.

Localities: Guaymas, April 14, one; Tiburon Island, July 3, three.

46. Megamyrmecon asceticum Chamberlin, new species



52

Fig. 52. *Megamyrmecon asceticum*, left palpus of male, ectal view.

Megamyrmecon californicum Banks (in part), Proc. Cal. Acad. Sci. 1898, ser. 3, I, p. 220.

Male: Carapace, sternum and legs light brown; abdomen grey, with the usual lighter mark at base above.

Posterior row of eyes of the typical form; the medians oblong and very oblique to each other, separated from each other by about half their lesser diameter and from the round laterals by nearly that diameter; eyes of anterior row subequal to each other.

Tibiae I and II with three seriate ventral spines, one being at base, one at middle and one at apex; metatarsi I and II with a pair of ventral spines at base; tibia III and apparently also tibia IV with a single median dorsal spine at base, but IV may possibly have had also a second dorsal spine. Palpus as shown in fig. 52. Length, 6.5 mm.

Type: Male, No. 1151, M. C. Z., collected at **La Chuparosa, Lower California**. *Paratypes* in M. C. Z. and Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, at Puerto Escondido, May 29, 1921, two immature females, probably of this species; Tortuga Island, May 11, 1921, one immature female; Ballena Island, June 9, 1921, one immature female.

In view of the occurrence of several species of *Megamyrmecion*, the identity of Simon's species *californicum* becomes less certain. It was based upon an immature female. It differs from the present species in having under the anterior tibiae one pair and a single spine instead of three seriate ones, and in the form and closer approximation of the posterior median eyes. It was described from southern California.

47. *Megamyrmecion pessimisticum* Chamberlin, new species



53

Fig. 53. *Megamyrmecion pessimisticum*, right palp of male, ectal view.

Male: Carapace, sternum and legs fulvous; abdomen grey.

Eyes related essentially as in *naturalisticum*, but the posterior medians somewhat more elongate and oblique. Spining of the legs as in *naturalisticum* ex-

cepting that on the anterior face of tibia I there is only a single spine instead of two. The palpus differs from that species in the form of the tibial apophyses and particularly in the details of the bulb as shown in fig. 53.

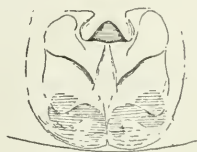
A smaller form, the length being 5.2 mm.

Type: Male, No. 1400, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 6, 1921, at Angeles Bay, Lower California.

48. *Megamyrmecon naturalisticum* Chamberlin, new species



54



55

Fig. 54. *Megamyrmecon naturalisticum*, right palpus of male, ectal view.

Fig. 55. Epigynum of female.

Male: Carapace, sternum and legs yellowish-brown to nearly clear yellow; abdomen grey or dark grey, with a median dorsal reddish-yellow mark at anterior end above.

Posterior row of eyes semicircular as usual; median eyes subcircular or somewhat quadrate and somewhat larger than the laterals, separated from each other by a little less than their radius and from the laterals by about two-thirds their diameter; anterior row of eyes strongly procurved; medians circular, decidedly larger than the laterals, separated from each other by less than their radius. Width of clypeus about equal to the diameter of an anterior lateral eye.

Tibia I and II with three pairs of spines beneath and with two spines on anterior face; metatarsi I and II with a pair of ventral spines at base and a single spine near middle; Tibia III with one median dorsal spine; tibia IV with two median dorsal spines. Palpus, fig. 54

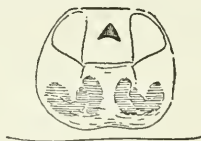
Length, 6 mm.; tibia + patella IV, 4 mm.

Female: Color as in the male, but abdomen without the lighter basal area. A young female has the abdomen lighter, somewhat yellowish-grey.

Posterior median eyes smaller, separated by more than their radius, and from the laterals by nearly their diameter. Tibia I and II armed beneath with three pairs of spines as in the male, but on the anterior face of tibia I there is only one spine, this small and toward base, and on tibia II there is also one spine but this is toward the distal end; metatarsi I and II with three spines as in the male; tibiae III and IV with a median dorsal spine as in the male. Epigynum, fig. 55.

Type: Male, No. 1401, and *allotype*, female, No. 1402, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 28, 1921, on **San Luis Island, Gulf of California**. *Paratype* in M. C. Z., one male, and two immature females, same data.

49. *Megamyrmecon nesiotes* Chamberlin, new species



56

Fig. 56. *Megamyrmecon nesiotes*, epigynum.

Female: Carapace, sternum and legs yellow, abdomen light grey.

Posterior row of eyes strongly procurved, the eyes subequal and nearly equidistant, the separation in each case being by about half of the longer diameter; anterior row of eyes also strongly procurved, the medians round, decidedly larger than the laterals, separated by nearly their radius. Clypeus somewhat narrower than the diameter of an anterior lateral eye. Tibia I armed with two pairs of spines beneath; metatarsus I with a single spine beneath at base; tibia II below with two pairs of spines as in I and in addition with a single spine at distal end; metatarsus II with a single spine at base beneath; tibia IV with two spines on median dorsal line; tibia III with one. All tarsi scopulate; anterior metatarsi scopulate to their bases, the posterior metatarsi only distally. Epigynum, fig. 56. Length, 7 mm.

Type: Female, No. 1403, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 24, 1921, on **Danzante Island, Gulf of California**. *Paratype* in M. C. Z., San Diego Island, June 11, 1921, one female.

Differs from *M. californicum* in having the eyes of the posterior row equidistant instead of having the medians much nearer to each other than to the laterals, in the spinning

of the anterior legs, and in having two dorsal spines on tibia IV instead of only one.

Megamyrmecon sp.

Immature specimens of uncertain species were taken at the localities indicated below.

Localities: Isla Partida, June 25, one; San Diego Island, May 27, one; Isla Raza, April 21, one; San Pedro Nolasco Island, April 16, one, taken by E. P. Van Duzee.

50. *Cesonia classica* Chamberlin, new species



57

Fig. 57. *Cesonia classica*, epigynum.

Female: Carapace reddish-yellow, with a black stripe along upper border of each side and the lateral margins also black; sternum and legs yellow; abdomen yellowish, marked on the dorsum with three longitudinal black stripes of which the lateral ones extend to the spinnerets; the median furcate at its caudal end a little distance in front of the spinnerets, one branch running to the lateral stripe on each side; venter pale, greyish yellow.

Posterior row of eyes straight or scarcely recurved; median eyes less than their diameter from the laterals, and once and a half their diameter from each other; anterior median eyes slightly smaller than the laterals; nearly four-fifths their diameter apart; area of median eyes wider behind than in front in the ratio 5:4.

Tibiae I and II with two seriate spines under the anterior border; metatarsi I and II with a single spine at base. Epigynum, fig. 57. Length, 5 mm.

Type: Female, No. 1404, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 25, 1921, on **Monserate Island, Gulf of California**. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z.; Guaymas, April 9, one female, E. P. Van Duzee; Tepoca Bay, April 25, 1921, one immature female; Ensenada,

Lower California, April 7, one immature female; Santa Inez Island, May 13, one female; Sal si Puedes Island, May 9, two immature females.

In color pattern this species resembles *C. lugubris* (Cambridge), but in the latter, of which *C. trivittata* Banks appears to be a synonym, the median stripe of the abdomen has its caudal end not furcate or when with branches the latter run straight caudad to the spinnerets, not outward to the lateral stripes. In addition the epigyna are very different.

51. *Gnaphosa synthetica* Chamberlin, new species

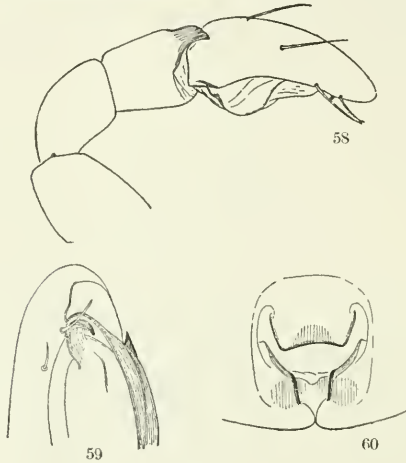


Fig. 58. *Gnaphosa synthetica*, right palp of male, ectal view.

Fig. 59. Distal portion of palp of male, apical spines omitted, ventral view.

Fig. 60. Epigynum.

Female: Carapace light, slightly reddish brown, darker over anterior part of head; sternum more chestnut; legs yellowish; abdomen brownish-grey, a darker median longitudinal mark along the dorsum.

Posterior row of eyes recurved; medians somewhat broadly oblong or broadly obovate, oblique, separated from each other by nearly their diameter, equal in size to the laterals or but little longer; anterior median eyes smaller than the laterals; anterior lateral eyes larger than the posterior laterals; lateral

eyes on each side separated from each other by nearly twice the diameter of the posterior one.

Tibiae I and II unspined, or, rarely, with one spine at distal end; metatarsus I with a single spine at base; metatarsus II with one spine or with two spines at base; tibiae III and IV both without any median dorsal spine. Epigynum, fig. 60. Length, 9 mm.

Male: The allotype has the cephalothorax lighter, more yellowish, than in the female. Eyes as in the female but rather closer, the separation of the laterals and especially the separation of the posterior medians from the laterals being relatively less. Palpus, figs. 58 and 59. Length, 6 mm.

Type: Female, No. 1405, and *allotype*, male, No. 1406, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 28, 1921, on **San Luis Island, Gulf of California**, taken under a piece of driftwood on the beach. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z., one female same data as type; Tepoca Bay, April 25, one female; southern end of Tiburon Island, July 5, one immature female.

This species in the spining of the legs and in general appearance approaches *G. hirsutipes* Banks, but differs in the somewhat larger size, in the smaller and more widely separated posterior median eyes, and in the details of the epigynum and palpus.

52. *Zelotes monachus* Chamberlin, new species



61

Fig. 61. *Zelotes monachus*, right palpus of male, ectal view.

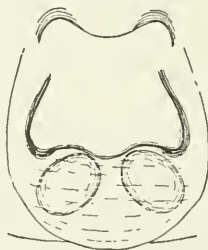
Male: Carapace somewhat chocolate-colored, the sternum a lighter brown; legs dusky brown or blackish; abdomen dark grey or blackish above, the venter paler.

Posterior row of eyes straight; the median eyes not elongate, larger than the laterals, separated from each other by their radius, or a little more, and nearly the same distance from the laterals; anterior median eyes small, their diameter to that of the laterals as 4.5:7, separated from each other by somewhat more than their diameter; area of median eyes longer than wide, and a little wider behind than in front (14:13).

Upper margin of furrow of chelicera with four teeth, of which the second from the proximal end is much the largest; lower margin with two teeth. Metatarsi I and II with a pair of spines at base; tibiæ I and II unarmed. Palpus, fig. 61. Length, 6 mm.

Type: Male, No. 1407, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 5, 1921, at Angeles Bay, Lower California. One adult and one immature male "found running on sand on beach before the advancing tide."

53. *Zelotes catholicus* Chamberlin, new species



62

Fig. 62. *Zelotes catholicus*, epigynum.

Female: Carapace, sternum and legs light chestnut; abdomen dorsally slightly yellowish-white, with a broad dusky band over posterior three-fourths of length.

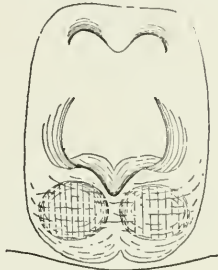
Posterior row of eyes slightly procurved; median eyes somewhat oblong, oblique, separated from each other by one-half their longer diameter, a little farther from the laterals; anterior median eyes decidedly smaller than the laterals, their diameters comparing as 3:4, slightly more than their radius from each other; area of median eyes as wide in front as behind and equal in length and breadth.

Upper margin of the furrow of the chelicera with five teeth, the lower with two. Tibiæ I and II unarmed beneath; metatarsus I with no spines; metatarsus II with a pair of ventral spines at base. Epigynum, fig. 62. Length, 5 mm.

Type: Female, No. 1408, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 30, 1921, on "Isla Partida" of **Espiritu Santo Island, Gulf of California.**

This species somewhat resembles *Z. funestus* (Keyserling), a common Californian species, but is decidedly different in the form of the epigynum and is much lighter in general color.

54. *Zelotes calvanisticus* Chamberlin, new species



63

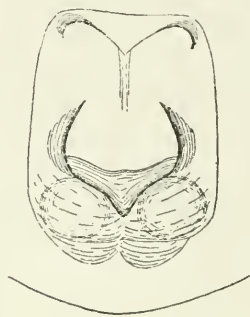
Fig. 63. *Zelotes calvanisticus*, epigynum.

Female: Carapace blackish over chestnut; sternum a clearer chestnut; legs blackish; abdomen dusky brown above, grey beneath, without markings.

Posterior row of eyes straight; eyes equidistant, each two being separated by about their radius; median eyes more or less angled; anterior median eyes greatly exceeded in size by the laterals, the diameters comparing as 5:8, separated from each other by their diameter; area of median eyes wider behind than in front in about ratio 5:4. Upper margin of furrow of chelicera with four teeth, the lower with two; metatarsus I unarmed; metatarsus II with a pair of spines at base; tibiae I and II unarmed. Epigynum, fig 63. Length, 7 mm.

Type: Female, No. 1409, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 9, 1921, on **Ballena Island, Gulf of California.** One adult and one immature female.

Similar to *catholicus* in spining of legs, but larger and much darker, with four teeth on upper margin of chelicera instead of five, and with eyes and epigynum different.

55. *Zelotes protestans* Chamberlin, new species

64

Fig. 64. *Zelotes protestans*, epigynum.

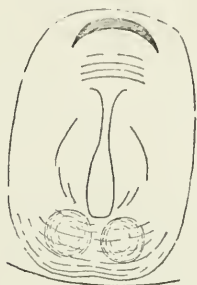
Female: Carapace and legs mahogany or blackish; sternum chestnut; abdomen dark grey or blackish above, light grey beneath.

Posterior row of eyes straight; median eyes elliptic and oblique, about half their longer diameter apart, obviously farther from the laterals; anterior median eyes about four-fifths their diameter apart, their diameter five-eighths that of the laterals.

Upper margin of furrow of chelicera with three well-formed teeth and a slight angle proximad of these; lower margin with two small teeth. Metatarsus I unarmed; metatarsus II with one spine at base; tibiæ I and II unarmed. Epigynum, fig. 64. Length, 7 mm.

Type: Female, No. 1410, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 14, 1921, at **Guaymas, Sonora**. One female "collected at base of hill north of Guaymas. Lava rock entirely. Hill practically bare except for scattered mesquite, cholla and similar vegetation."

Readily distinguished from species described above in having only three teeth on upper margin of furrow of chelicera and a single spine on metatarsus II.

56. *Zelotes reformans* Chamberlin, new species

65

Fig. 65. *Zelotes reformans*, epigynum.

Female: Carapace, sternum and legs dark chestnut, in part dusky; abdomen grey or brownish grey, lighter beneath and with a somewhat vague median dorsal mark above, this pointed behind.

Posterior row of eyes straight or even slightly recurved; median eyes transversely somewhat elongate, nearly their diameter apart, the same distance, or slightly less, from the laterals; anterior median eyes their diameter or more apart, much smaller than the laterals the diameter of which is twice as great or nearly so; area of median eyes wider behind than in front in ratio of 15:10 or 11.

Upper margin of furrow of chelicera with three teeth, the lower with one small one or with a second obscure one in addition. Metatarsi I and II and also tibiae I and II wholly lacking spines. Epigynum, fig. 65. Length, 7 mm.

Type: Female, No. 1411, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 14, 1921, at **Guaymas, Sonora**. One female, with same habitat as noted for *Z. protestans*.

Zelotes sp.

Immature specimens not definitely referable to their species were taken at the localities indicated below.

Localities: Las Animas Bay, May 8, two; Ensenada, April 7, two; Isla Raza, April 21, one; Pelican Island, July 6, one; Tiburon Island, July 5, one; San Diego Island, May 28, one; San Esteban Island, April 19 and 20, five.

Genus *Drassyllus* Chamberlin

The two new species of this genus here described may be placed among the previously known species of the genus by means of the following key.

Key to Species of Drassyllus

MALES

- a₁. Upper margin of furrow of chelicera with four teeth.
 - b₁. Tibia I with a median ventral spine. *D. transversus* (Emerton).
 - b₂. Tibia I with no ventral spine.
 - c₁. Tibial apophysis of palpus abruptly bent near or a little beyond middle.
 - d₁. Tibial apophysis bent upward at right angles near middle; tib. + pat. I as long as cephalothorax. *D. depressus* (Emerton)
 - d₂. Tibial apophysis smaller and less abruptly bent; tib. + pat. I shorter than cephalothorax. *D. socius* Chamberlin
 - c₂. Tibial apophysis of palpus not abruptly bent near middle, at most curved or bent near tip.
 - d₁. Carapace black.
 - e₁. Lower margin of chelicera with three teeth. *D. fallens* Chamberlin
 - e₂. Lower margin of chelicera with two teeth.
 - f₁. Posterior median eyes circular; tibial apophysis of palpus much shorter than tibia, broad except at tip. *D. empiricus* new species.
 - f₂. Posterior median eyes elliptic and oblique; tibial apophysis of palpus as long as tibia or very nearly so, more slender throughout. *D. laccus* (Barrows)
 - d₂. Carapace yellowish or fulvous; lower margin of furrow of chelicera with two teeth; median ventral apophysis of palpus short and bluntly rounded. *D. rufulus* (Banks)
- a₂. Upper margin of furrow of chelicera with five or six teeth.
 - b₁. Lower margin of furrow of chelicera with two teeth or nodules, or one of these obsolete; metatarsus II with three ventral spines.
 - c₁. Tibia II unarmed ventrally; tibial apophysis of palpus much shorter than tibia, its upper distal angle not prolonged. *D. liopus* Chamberlin
 - c₂. Tibia II armed with two or three ventral spines; tibial apophysis longer than tibia, its upper distal angle acutely prolonged. *D. irritans* (Chamberlin)
 - b₂. Lower margin of furrow of chelicera with three teeth or nodules.
 - c₁. Tib. + pat. I longer than cephalothorax; median ventral apophysis of palpus distally straight. *D. dromeus* Chamberlin.
 - c₂. Tib. + pat. I equal in length to or shorter than the cephalothorax.
 - d₁. Abdomen light grey or whitish; cephalothorax 3 mm. long. *D. blandus* (Banks)

- d₃. Abdomen darker grey to black; cephalothorax 2.5 mm. or less in length.
- e₁. Tibial apophysis of palpus abruptly bent at tip; area of median eyes plainly longer than wide and as wide in front as behind. *D. frigidus* (Banks)
- e₂. Tibial apophysis not abruptly bent at tip; area of median eyes essentially equal in length and breadth, wider behind than in front. *D. proclesis* (Chamberlin)

FEMALES

- a₁. Lower margin of furrow of chelicera with two teeth or nodules, or, rarely one or both of these obsolete.
- b₁. Tibia III, or both tibiae III and IV with a median dorsal spine at base.
- c₁. Both tibia III and IV with a median dorsal spine at base. *D. apachus* Chamberlin
- c₂. Only tibia III with a median dorsal spine at base. *D. rationalis* new species
- b₂. Tibiae III and IV with no median dorsal spine.
- c₁. Epigynum with a well chitinized long anterior rim.
- d₁. Anterior rim of epigynum distinctly bowed caudad at middle, concave at the ends.
- e₁. Lateral ridges of epigynum strongly bowed mesad at middle (Eastern States) *D. rufulus* (Banks)
- e₂. Lateral ridges of epigynum not at all bowed mesad. *D. irritans* (Chamberlin)
- d₂. Anterior rim of epigynum straight or but little concave at middle, with strongly projecting angles at the ends. *D. niger* (Banks)
- c₂. Epigynum with no such anterior rim, the lateral ridges only weakly developed.
- d₁. Median plate of epigynum prominent, broad, caudally expanded and ending freely near middle of area. *D. femoralis* (Banks)
- d₂. Median plate less prominent and less broad, its caudal end not free. *D. laccus* (Barrows)
- a₂. Lower margin of furrow of chelicera with three teeth or nodules.
- b₁. Upper margin of furrow of chelicera with four teeth.
- c₁. Tibia + patella I as long as tibia + patella IV and plainly longer than cephalothorax. *D. louisianus* (Chamberlin)
- c₂. Tibia + patella I shorter than tibia + patella IV and at most equal in length to the cephalothorax.
- d₁. Tibia + patella I equal in length to the cephalothorax, tibia + patella IV exceeding it; median plate of epigynum differentiated, inversely T-shaped. *D. depressus* (Emerton)
- d₂. Tibia + patella I shorter than cephalothorax, tibia + patella IV equalling it; median plate of epigynum either not distinctly differentiated or not inversely T-shaped.
- e₁. Epigynum with median plate expanded caudally and ending anteriorly toward middle of median channel; anterior rim angled. *D. fallens* Chamberlin

- e₂. Epigynum with no such median plate, the anterior rim simply bowed.....*D. eremitus* Chamberlin
- b₂. Upper margin of furrow of chelicera with five teeth.
 - c₁. Epigynum with a well chitinized transverse rim; cephalothorax 2 mm. or more in length.
 - d₁. Anterior rim of epigynum bent forward in a sharp angle.
 - e₁. Anterior rim meeting the lateral one on each side in an acute caudally prolonged angle.....*D. orgilus* Chamberlin
 - e₂. Anterior rim not meeting the laterals in any such angle.*D. frigidus* (Banks)
 - d₂. Anterior rim of epigynum straight or evenly curved at middle.
 - e₁. Posterior portion of dorsum of abdomen blackish; lateral ridges of epigynum strongly chitinized.
 - f₁. Tarsi and the anterior metatarsi, at least distally, scopulate; lateral ridges of epigynum each ending in a conspicuous angle behind.....*D. lepidus* (Banks)
 - f₂. Tarsi not truly scopulate; lateral ridges of epigynum not angled behind.....*D. aprilinus* (Banks)
 - c₂. Dorsum of abdomen uniformly colored; lateral ridges of epigynum weakly defined, the anterior rim extending beyond them.....*D. virginianus* Chamberlin

57. *Drassyllus empiricus* Chamberlin, new species



66

Fig. 66. *Drassyllus empiricus*, right palpus of male, ectal view.

Male: Carapace dark mahogany colored; sternum more brown; legs dusky; abdomen black, somewhat paler below.

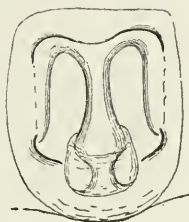
Posterior row of eyes very nearly straight; the median eyes sub-circular, much larger than the laterals, nearly contiguous with each other and only about one-fourth their diameter from the laterals; anterior median eyes fully their diameter apart, greatly exceeded in size by the laterals, the diameters comparing as 5:7.5.

Upper margin of furrow of chelicera with four teeth; lower margin of furrow with two teeth, or, in type, on one side with a minute third one laterally from the distal one of these. Anterior tibiae unarmed below; tibia IV with no median dorsal spine. Palpus, fig. 66.

Length, 4.8 mm.; cephalothorax, 2.5 mm.; tib. + pat. IV., 2.5 mm.

Type: Male, No. 1412, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 7, 1921, at **Ensenada, Lower California**.

58. *Drassyllus rationalis* Chamberlin, new species



67

Fig. 67. *Drassyllus rationalis*, epigynum.

Female: Carapace reddish-brown, dusky on the sides; sternum brown; legs reddish-yellow; abdomen black or nearly so above and laterally, lighter beneath.

Posterior row of eyes slightly procurved; median eyes moderately large, oblique, separated from each other by less than half their longer diameter and from the laterals by a nearly equal distance; anterior median eyes much smaller than the laterals, the diameters comparing as 3:4.

Lower margin of furrow of chelicera with two small teeth or nodules, the upper margin with five, of which the second from the most proximal is largest, the others decreasing toward claw. Tibiæ I and II unarmed below; metatarsi I and II with a pair of spines between base and middle; tibiæ III with a median dorsal spine at base, tibia IV with no such spine. Epigynum, fig. 67.

Length, 4.5 mm.

Type: Female, No. 1413, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 5, 1921, at **Angeles Bay, Lower California**. One adult female and one female apparently lacking one moult of maturity. *Paratype* in M. C. Z. (immature female).

Evidently related to *D. apachus* Chamberlin, known from Arizona, in form of epigynum and in general structure. It is easily separated by the lack of a median dorsal spine on tibia IV and in the relatively larger size and closer approximation of the posterior median eyes.

ZODARIIDÆ

59. *Homalonychus positivus* Chamberlin, new species

68

Fig. 68. *Homalonychus positivus*, epigynum.

Female: Carapace chestnut, with a small dark spot on each side of posterior end of head and three dark spots on each side of pars thoracica; sternum also chestnut, the legs more brownish; dorsum of abdomen reddish-yellow or somewhat orange-colored, the sides and venter lighter or else more grey; dorsum of abdomen clothed with numerous, short, erect hairs and with areas of stiffer, more spiniform setæ.

Anterior row of eyes procurved; median eyes fully their diameter apart, rather less than a third as far from the laterals; diameter of the latter about four-fifths that of the medians. Clypeus five times as high as the diameter of a lateral eye. Margins of furrow of chelicera unarmed. Tibia I with four pairs of long spines beneath, anterior face with two or three spines, posterior face with three; tibia II with four pairs of ventral spines, three pairs on anterior and same number on posterior face. Epigynum, fig. 68. Length, 10-11 mm.

Type: Female, No. 1414, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 14, 1921, at Guaymas, Sonora. *Allotype*, male, No. 1415, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 9, 1921, at Guaymas, Sonora. *Paratypes*: Guaymas, April 15, two females, J. C. Chamberlin; Guaymas, April 12, 1921, three females, E. P. Van Duzee, taken under stones with egg sacks; Tiburon Island,

July 3, 5, two females; San Pedro Bay, July 7, one adult and one immature female.

Differing from *H. selenepoides* Marx and *H. theologus* new species, the only other species of the genus known, particularly in the form of the epigynum; e. g. in having the median piece pointed behind instead of truncate or obtuse.

60. *Homalonychus theologus* Chamberlin, new species



69

Fig. 69. *Homalonychus theologus*, epigynum.

Homalonychus selenepoides Banks (nec Marx), Proc. Cal. Acad. Sci., 1898, Ser. 3, I, p. 214.

Female: Carapace, sternum and legs chestnut; dorsum of abdomen greyish yellow, the venter grey; setæ as in *positivus*.

Anterior row of eyes procurved; median eyes their diameter apart, equal in size to eyes of second row; laterals five-sixths the diameter of the medians; anterior row of eyes longer than the posterior in the ratio 28:23.

Anterior tibiæ with spines as in *positivus*. Epigynum, fig. 69.

Length, 10 mm.; cephalothorax, 5.1 mm.; tibia + patella IV, 7.6 mm.; tibia + patella I, 7 mm.

Type: Female, M. C. Z., San Jose del Cabo, Lower California. *Paratypes* in M. C. Z. and Mus. Calif. Acad. Sci.; Sierra San Lazaro (M. C. Z.); Angeles Bay, May 6, 7, June 26, four females, one immature male; La Paz, June 5, one female taken near the beach; San Luis Gonzaga Bay, April 29, one female; Puerto Escondido, May 29, four females, one male; Mejia Island, April 30, one adult female; Puerto Ballandra, Carmen Island, May 22, one female; San Francisco Island, May 29, one female; Danzante Island, May 29, one female; San Josef Island, June 9, two females;

Espiritu Santo Island, May 31; Santa Cruz Island, May 27, three females; San Marcos Island, May 12, several; Coronados Island, May 18, several females.

Homalonychus sp.

Immature specimens not referred to particular species were taken at the localities listed below.

Localities: Angeles Bay, June 25, one; Cuesta Blanca, 10-15 miles north of Loreto, May 20, one; La Paz, April 11, one; Santa Catalina Island, June 12, one; Angel de la Guarda Island, May 1, one; Pond Island, July 1, one; Espiritu Santo Island, June 8, one; Pelican Island, July 5, one; Ballena Island, June 9, one.

Pholcidae

61. *Artema atlanta* Walckenaer

Ins. Apt., 1837, I, p. 656.

Locality: Loreto, May 18, 1921, several specimens taken on ceiling of boat agency's office. The field note records them as very fast in movement.

This is a widespread species in South America and the West Indies.

62. *Physocyclus mysticus* Chamberlin, new species



70



71

Fig. 70. *Physocyclus mysticus*, right chelicera of male, ectal view.

Fig. 71. Right palpus of male, mesal view.

Male: Carapace yellow, with brownish marks radiating from the thoracic grooves, on median line of head being line-like and pointed, and that running

caudad cuneate in form with wide end behind; sternum yellow, immaculate; legs yellow, the femur with black annulus at tip; patella with annulus at proximal end; and tibia with three rings of which the proximal is most distinct and the median one may be absent on anterior pairs; abdomen yellow with dusky markings above.

The cephalothorax has no elevation behind, but with eye-tubercle elevated as usual. Chelicerae a little prominent in front toward upper end but lacking the usual process below, fig. 70. Abdomen shaped nearly as in *P. globosus* Taczanowski. Palpus, fig. 71. Length, 6 mm.

Type: Male, No. 1416, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 22, 1921, on Tortuga Island, Gulf of California, readily distinguished in lacking the usual horn on the chelicera. *Paratypes*: San Francisquito Bay, May 10, one male; Puerto Escondido, June 14, 1921, one female probably of this species; Ballena Island, June 9, 1921, one female, probably of this species.

63. *Psilochorus dogmaticus* Chamberlin, new species



72

Fig. 72. *Psilochorus dogmaticus*, subventral view of anterior portion of abdomen of female, showing epigynal ridges and spinnerets.

Female: Carapace and sternum yellow; legs yellow with a dusky ring at distal end of femur and one at proximal end of tibia usually less distinct; abdomen dusky grey, with a basal sagittate mark above and paired darker areas of minute dots each side and behind, these sometimes indistinct.

Abdomen notched or furrowed at base as seen from above; spinnerets carried far forward beneath, adjacent to epigynal projection. Posterior row of eyes straight, the medians more than their diameter apart. Distinguished particularly by form of the epigynal sides which are wide, moderately bowed, and only slightly concave at middle, fig. 72. Length, 2.2 mm.

Type: Female, No. 1417, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 7, 1921, on **Ceralbo Island, Gulf of California**. *Paratypes*: Same data, two adult and two immature females; Espiritu Santo Island, May 3, 1921, three females; Tortuga Island, June 22, 1921, one female; San Marcos Island, May 12, 1921, four females; Salinas Bay, Carmen Island, June 16, 1921, one female; Puerto Escondido, May 29, 1921, one female.

64. *Psilochorus utahensis* Chamberlin

Ann. Ent. Soc. America, 1919, XII, p. 247.

Locality: San Pedro Bay, July 7, 1921, one male.

In addition females from Guaymas and Nogales, Arizona, are referred to this species with some doubt, as they are not in good condition.

65. *Psilochorus agnosticus* Chamberlin, new species

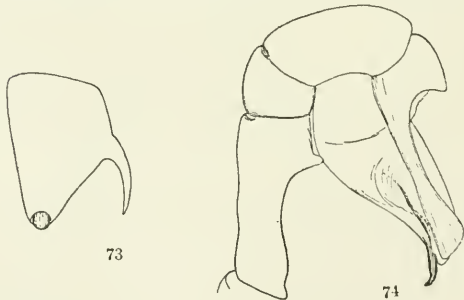


Fig. 73. *Psilochorus agnosticus*, right chelicera of male, ectal view.

Fig. 74. Right palpus of male, ectal view.

Male: Carapace, sternum, and legs yellow; abdomen darker, showing a white or silvery background closely areolated with a network of dark lines and maculate over dorsum with black spots.

Posterior row of eyes a little procurved; median eyes their diameter or more apart; anterior median eyes much smaller than laterals as usual. Process of chelicera arising a little above middle; much more slender and distally more curved downward than in *pullulus* (Hentz) and *utahensis* Chamberlin, where the process is at base. The process is in position of that in *californiæ* Chamberlin but is longer and more strongly curved, fig. 73. Palpus, fig. 74.

Length, 1.8 mm.

Female: Both rims of the epigynal projection prominent and notched at middle. Length, 2.2 mm.

Type: Male, No. 1418, and *allotype*, female, No. 1419, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 21, 1921, on Isla Raza, Gulf of California. *Paratypes*: Same data, one adult male and two immature females; Isla Partida, July 2, 1921, four specimens.

Psilochorus sp.

Immature individuals of uncertain species were taken at the localities listed below:

Localities: Santa Inez Island, May 13, two; Coronados Island, May 18, one; Carmen Island, May 22, one; Danzante Island, May 24, one; Monserrate Island, May 25, one; San Josef Island, May 28, one; Ceralbo Island, June 6, one; Espiritu Santo Island, June 8, one; Ballena Island, June 9, one; Concepcion Bay, June 18, one; North San Lorenzo Island, June 24, one.

66. Psilochorus pullulus Hentz

Theridion pullulum Hentz, Jour. Bost. Soc. N. H., 1850, VI, p. 282.

Psilochorus pullulus Simon, Hist. Nat. Ar., 1893, I, p. 482, f. 474, 475.

Locality: Nogales, Arizona, April 4, 1921, E. P. Van Duzee.

One female, doubtfully referred to this species, which occurs from the middle latitudes of the United States southward to Patagonia.

THERIDIIDÆ

67. *Euryopsis californica* Banks

Proc. Cal. Acad. Sci., 1904, ser. 3, III, p. 345, pl. 39, figs. 23, 36.

Locality: Concepcion Bay, June 18, one female.

Previously known from California.

68. *Theridion studiosum* Hentz

Jour. Bost. Soc. Nat. Hist., 1850, VI, p. 275, pl. 9, fig. 5.

Locality: San Francisquito Bay, May 10, one female.

A species ranging from the southern United States through Mexico and into South America.

69. *Theridion positivum* Chamberlin, new species

75

Fig. 75. *Theridion positivum*, epigynum.

Female: Carapace, sternum, labium, endites and chelicerae black; legs pale yellow, narrowly and incompletely annulate with black, the black often appearing chiefly as dots or cross-lines; abdomen white, unmarked above and laterally; venter with a longitudinal black band that anteriorly encircles the pedicel, extends to the spinnerets, and encloses a central white spot just behind the epigastric furrow.

Abdomen in outline as viewed directly from above as wide as or wider than long. Epigynum, fig. 75. Length, 2 mm.

Type: Female, No. 1420, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, July 1, 1921, on **Pond Island, Gulf of California**. Paratypes: Same data, three females taken in sweeping, chiefly from Aster and Melochia; Concepcion Bay, June 17, one female; San Josef Island, June 10, three immature specimens; South San Lorenzo Island, June 29, one immature male; North San Lorenzo Island, June 29, three immature specimens.

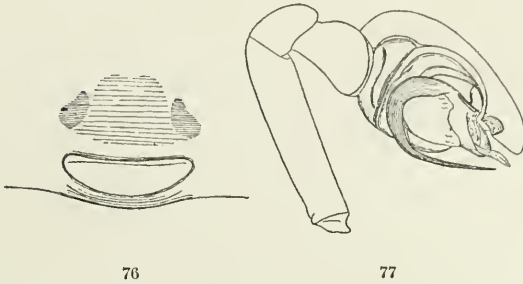
70. *Theridion analyticum* Chamberlin, new species

Fig. 76. *Theridion analyticum*, epigynum.
 Fig. 77. Right palpus of male, ectal view.

Female: Suggesting *T. studiosum* Hentz in general markings and appearance. Carapace fulvous with a black median band and black lateral borders; sternum dusky, often with a deeper median longitudinal stripe; legs annulate with black; abdomen with a dorsal black band over whole length, the band with edges serrate and bordered with white; venter also with a longitudinal black band reaching to the spinnerets which it partly surrounds, the spinnerets being also black.

The epigynum, while of the same general type, differs clearly from that of *T. studiosum* and the allied *T. eximium* (fig. 76). Length, 4 mm.

Male: Palpus as shown in fig. 77.
 Length, 3.2 mm.

Type: Male, No. 1421, and *allotype*, female, No. 1422, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 20, 1921, on San Esteban Island, Gulf of California, by beating from shrubs. *Paratypes*: Same data, 18 examples; San Carlos Bay, July 7, 1921, one female; La Paz, April 11, 1921, six; Mulegé, May 14, one female; San Francisco Bay, July 7, five immature; San Evaristo Bay, June 10, two young; Tiburon Island, south end, July 3, 5, five; San Pedro Nolasco Island, April 17, nine, partly immature, E. P. Van Duzee; San Josef Island, June 10, one female.

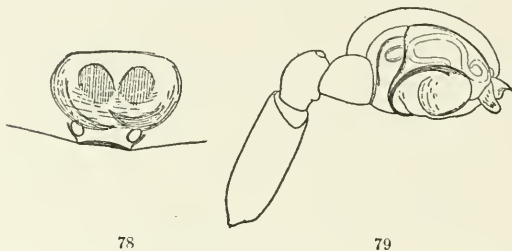
71. *Theridion geminipunctum* Chamberlin, new speciesFig. 78. *Theridion geminipunctum*, epigynum.

Fig. 79. Right male palpus, ectal view.

Female: Carapace clear yellow, with a narrow marginal line on each side of pars thoracica black; sternum yellow, sometimes with a dark marginal mark opposite the base of each leg; labium and endites slightly dusky; chelicerae yellow; legs yellow, annulate with dark, the annuli narrow; abdomen white above and laterally; venter grey in front of epigastric furrow and in an area in front of the spinnerets, white between these two areas, with this white band enclosing a pair of black dots which are occasionally only slightly indicated or may be wholly absent.

Abdomen in outline as viewed from above longer than wide. Epigynum, fig. 78. Length, up to 2.25 mm., but mostly near 2 mm.

Male: Palpus as shown in fig. 79.

Type: Male, No. 1423, and *allotype*, female, No. 1424, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, July 1, 1921, on **Pond Island, Gulf of California**. *Paratypes*: Same data, about 18 specimens, male and female, partly immature, swept principally from Erigeron and Melochia along with *T. positivum*; San Francisquito Bay, May 10, 1921, two; Pond Island Bay, Angel de la Guarda Island, June 30, six young; South San Lorenzo Island, June 29, one immature male; North San Lorenzo Island, June 29, four immature.

72. *Theridion tepidariorum* C. Koch

Die Arachniden, 1841, VIII, p. 75, figs. 647, 648.

Locality: Ensenada, April 7, one female.

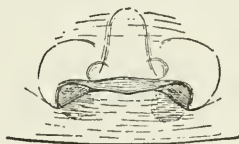
A cosmopolitan species occurring commonly about buildings.

73. *Latrodectus mactans* (Fabricius)

Aranea mactans, Fabricius, Entom. Syst., 1793, II, p. 410.

Latrodectus mactans, Keyserling, Spinnen Amerikas, Theridiidæ, 1884, I, p. 145, pl. 7, fig. 91.

Localities: Guaymas, April 9, eight females collected by E. P. Van Duzee; San Pedro Bay, July 7, one immature female; Concepcion Bay June 18, one female; San Francisquito Bay, May 10, two females; Nogales, Arizona, April 4, two immature, E. P. Van Duzee; Isla Partida, April 17, 22, three adult and two immature females; Isla Raza, April 21, three females; Santa Inez Island, April 13, three females; Patos Island, April 23, six females; San Diego Island, May 27, one female; Ildefonso Island, May 17, two females; San Marcos Island, June 20, one female; Pelican Island, July 5, four females.

74. *Teutana nesioles* Chamberlin, new species

80

Fig. 80. *Teutana nesioles*, epigynum.

Female: Carapace and sternum reddish-brown, without markings, the mouth-parts similar; coxæ and femora of the legs also reddish-brown, with those of the first two pairs dusky, the distal joints more yellowish, the patella tibia and metatarsus each with a darker annulus at distal end. Abdomen above somewhat rusty-brown; a white stripe across anterior face and back over each anterolateral corner, a median longitudinal white stripe over and behind middle partially constricted into somewhat triangular or diamond shaped areas; an oblique white mark down each side behind middle and another longitudinal mark in front of it; venter with a median hour-glass shaped white mark wider in front than behind and sometimes broken at its middle.

Anterior row of eyes moderately procurved, the eyes subequal; median eyes about their radius from each other, a little nearer to the laterals; posterior row of eyes straight, eyes equal, the medians a little less than their diameter apart and a little farther from the laterals. Epigynum, fig. 80. Length, 5 mm.

Type: Female, No. 1425, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 2, 1921, on Granite Island, Gulf of California. *Paratypes:* Same data, one female; Ceralbo Island, June 6, one immature female, probably of this species.

Teutana sp.

Locality: Granite Island, May 2.

A single female, with the epigynum apparently not yet fully formed, differs from the preceding species, with the types of which it was taken.

75. *Lithyphantes pulcher* Keyserling

Spinnen Amerikas, Theridiidae, 1884, I, p. 137, pl. 6, fig. 85.

Lithyphantes venustus Marx, Proc. Cal. Acad. Sci., 1898, Ser. 3, I, p. 239, pl. 14, fig. 2.

Localities: Angeles Bay, May 5, 6, four females; Puerto Escondido, May 29, one female; San Nicolas Bay, May 16, one female.

76. *Lithyphantes punctulatus* Marx

Proc. Cal. Acad. Sci., 1898, Ser. 3, I, p. 239, pl. 14, fig. 4.

Lithyphantes medialis Banks, *ibid.*, p. 240, pl. 14, fig. 3.

In the type of *L. punctulatus* the dorsal marks of the abdomen are more or less broken at the middle line so as to form pairs, but this is only one of numerous color variations occurring in this species. The epigynum is the same in all.

Localities: Guaymas, April 14, one normal female, and two very dark females with markings largely obscured; La Paz, June 4, four females taken "in their webs a few inches from ground with retreats under stones;" Puerto Escondido, May 29, one male; Angeles Bay, June 26, one male, three females; San Esteban Island, April 20, one female; Mejia Island, April 30, two females; San Pedro Martir Island, April 18, many; Patos Island, April 23, one female; San Pedro Nolasco Island, April 17, one, immature; Sal si Puedes Island, May 9, four females; Puerto Ballandra, Carmen Island, May 21, 22, three females; Espiritu Santo Island, May 30, three females; El Candeleros Bay, Espiritu Santo Island, June 8, one female; San Josef Island, May 29, one female; Porto Refugio, Angel de la Guarda Island, May 1, one female and one immature specimen taken at elevation of 1000 ft.; Monserrate Island, May 24, one female; San Diego Island, May 27, one female, probably this species but with markings reduced to scattered dots; Tortuga Island, May 18, one female; Coronados Island, May 18, two females; San Francisco Island, May 29, one; North San Lorenzo Island, June 24, one male and two females; Ceralbo

Island, June 7, three females, two of them immature, taken "at Rufo's ranch-house on west coast;" Isla Partida, June 24, two females and several immature; Santa Cruz Island, June 11, May 27, one female on each date; Smith's Island, June 27, two females and one male; Ballena Island, June 9, two females.

LINYPHIIDÆ

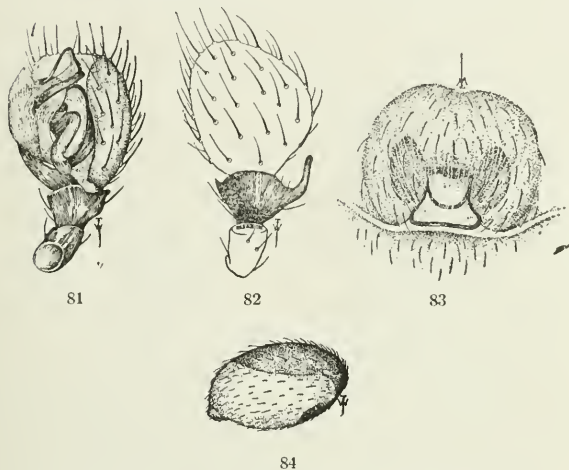
77. *Ceraticelus nesiotus* Crosby, new species

Fig. 81. *Ceraticelus nesiotus*, right palpus of male, subventral view.

Fig. 82. Same, dorsal view.

Fig. 83. Epigynum.

Fig. 84. Abdomen of male, lateral view.

Male: Length, 1.5 mm. Cephalothorax light brownish-yellow; area covered by the base of the abdomen sharply limited in front by a curved row of minute brownish setigerous tubercles; on the median line there are three larger hairs curved forward. Seen from the side, the cephalothorax is rather steeply declivate and slightly concave posteriorly, dorsally nearly level, and in front curves down to the eyes. Head not separately elevated. Viewed from above the cephalothorax is rather broad, rounded on the sides, convergent in front, not constricted. Eye area not black, but the eyes surrounded by narrow black rings; the anterior median on a common black spot. Clypeus slightly convex

and slightly protruding. Posterior eyes in a straight line, separated by about their diameter, the median slightly nearer to each other than to the lateral; anterior eyes in a straight line, the median smaller than the lateral, sub-contiguous, separated from the lateral by about the radius of a median. Sternum yellow slightly tinged with brown, the narrow margin brown, as broad as long, produced between the hind coxæ which are separated by their length, squarely truncate posteriorly. Labium darker than sternum. Endites brownish-yellow. Endites and sternum sparsely clothed with hairs arising from minute brownish tubercles. Chelicerae darker than the endites. Legs and palpi light brownish-yellow, patellæ paler than the other segments. Soft parts of abdomen nearly white, dotted with minute brown piliferous tubercles. Dorsal sclerite orange-yellow, restricted to the anterior two-thirds of the abdomen; narrower than the abdomen, the lateral margin serrate; anteriorly it extends over the front of the abdomen down to the pedicel; in front it appears rugose due to the stronger development of the piliferous tubercles. Epigastric plates well developed. On each there is a bean-shaped area in which the surface is finely striate. This area is opposed to a small tooth borne on the posterior distal angle of the hind coxa and doubtless serves as a stridulating organ. Infra-mammillary sclerite broad below, but narrow on the sides and above the spinnerets. The tibia of the palpus has a rather long, cylindrical, blunt process on the dorso-lateral angle. This is bent so as to lie nearly parallel to the axis of the segment. The palpal organ is of the type characteristic of the genus. The embolus makes a sharp turn at the point where it is joined by the ejaculatory duct. From this point the duct follows it closely to the tip. Paracymbium flat and curved into a semicircle.

Female: Length, 1.5 mm. Similar to the male in coloration. Dorsal sclerite confined to the anterior surface of the abdomen and when viewed from above visible merely as a narrow crescent. Epigastric plates separated from the sclerite bearing the epigynum by narrow but distinct intervals in which the integument is white like the rest of the abdomen. Infra-mammillary sclerite transverse, not extended along the sides of the spinnerets. The epigynum has a broad median depression squarely truncate in front and wider behind than in front, sides nearly straight. Anterior part of the depression occupied by a transverse sclerite, convex behind (fig. 83.)

Type: Male, No. 1426, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, July 3, 1921, at Willard's Point Bay, Tiburon Island, Gulf of California. *Allotype*, Female, No. 1427, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 3, 1921, at Palm Cañon, Angel de la Guarda Island. *Paratypes*: Same data as allotype, two males, four females.

This species is most closely related to *C. formosus* (Banks), of which *C. rugosus* Crosby is a synonym, common on the beach of the North Atlantic Coast and rarely found inland.

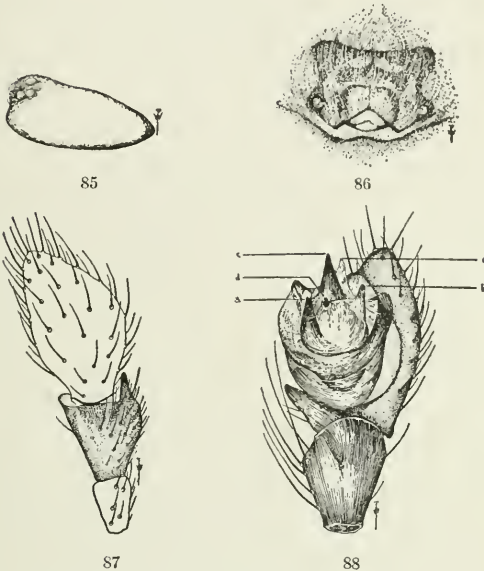
78. *Erigone eschatologica* Crosby, new speciesFig. 85. *Erigone eschatologica*, cephalothorax, lateral view.

Fig. 86. Epigynum.

Fig. 87. Palpus, dorsal view.

Fig. 88. Same, mesoventral view.

Male: Cephalothorax light brownish-yellow, dusted with grey and with a very narrow marginal grey line, a black spot between and below the anterior median eyes; viewed from above, broad, with sides rounded and with the outline constricted at the cervical groove; viewed from the side, gently arched to the cervical groove, where there is a slight depression, and then gently rounded over the head to the eyes. Clypeus slightly protruding and gently convex near the margin (fig. 85). Posterior eyes in a straight or very slightly recurved line, separated by about their diameter, the medians slightly closer to each other than to the laterals; anterior eyes in a straight line, equidistant, the median much smaller than the lateral.

Sternum grey over yellow. Hind coxæ separated by less than their diameter. Endites yellow at tip and greyish at base, armed with only a few setigerous tubercles. Chelicerae reddish-brown, not so strongly convex as in many species

of the genus; armed in front near the outer margin with a row of seven sharp teeth increasing in size from above, and on the front just above the furrow with a strong acute tooth. Legs and palpi light brownish-yellow; coxæ light greyish below; legs distinctly hairy. Abdomen grey, lighter in front and marked behind with several transverse whitish bands. Ventral aspect of abdomen broadly grey in the middle, with a light line on each side; epigastric plates yellowish, well separated by grey integument.

Femur of palpus moderately long and gently curved, not armed with teeth, but bearing on the ventro-lateral surface a row of four or five stiff hairs. Patella short and not armed with the usual tooth at tip below. Tibia one and one-half times as long as patella, evenly enlarged from base to apex, armed above with an apophysis, convex on the mesal side and straight or gently concaved ectally (fig. 87); outer side of this apophysis continuing the outline of the paracymbial echancre of the tarsus. Paracymbium strongly curved, and ending in a small hook. Embolic division of the palpal organ (fig. 88) consisting of a more or less triangular plate bearing a strong process at each corner; the basal one (a) black and sharp-pointed, the one nearest the tip (b) more slender and rounded at apex, the one on the ectal side (c) larger than the other, black, and acute. Situated in the midst of these points is the small and short embolus (d). Near the process (c) is a hyaline process (e); median apophysis appearing on the ectal side of the embolic division as a curved process with a broad curved end with a very uneven margin (not shown in the figure.)

In another specimen from Lower California, Puerto Escondido, June 14, 1921, which is light colored and had more recently moulted, the color pattern on the abdomen is more distinct. In front the abdomen is nearly white, with a median grey stripe which posteriorly joins a triangular transverse band; back of this is a broad whitish band narrowly interrupted in the middle; farther back are four narrow whitish bands, the last continuous with the light-colored area on the sides. Under side of abdomen grey with a large pale area in the middle. Length, 2 mm.

Female: Similar to the male in general coloration; abdomen marked much as in the light-colored male described above; there is, however, an indication of a transverse grey band across the light area on the front part of the abdomen. The usual teeth on the sides and on the inner angle of the chelicerae represented by setae borne on small tubercles. Epigynum (fig. 86) consisting of a broad plate; on each side of the hinder half is a depression bounded in front by a smooth transverse ridge; hind margin broadly excised, bringing into view the rounded edge of an underlying lobe. Length, 2.5 mm.

Type: Male, No. 1428, and *allotype*, female, No. 1429, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 19, 1921, on San Marcos Island, Gulf of California. *Paratypes:* Puerto Escondido, June 14, one male, two females.

This species belongs to that division of the genus, represented by *E. dentimandibulata* Keys., in which the teeth on the margin of the cephalothorax, the palpus, and the cheli-

ceræ are greatly reduced and in which the abdomen is ornamented with a pattern of dark and light bands similar to the markings in Grammonota. Simon (Hist. Nat. Ar. 1: 638, 1894) states that he has found several species of this type in Venezuela.

ARGIOPIDÆ

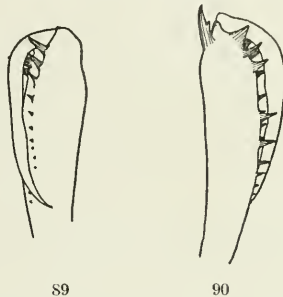
79. *Tetragnatha eremita* Chamberlin, new species

Fig. 89. *Tetragnatha eremita*, left chelicera, ventral view.

Fig. 90. Same, dorsal view.

Male: Lateral eyes on each side nearer together than are the medians, their tubercles connected by a dark line. Chelicerae nearly seven-eighths as long as the cephalothorax; fang without a definite tooth or cusp at base; at distal end above and close to base of fang a conspicuous curved process which bears a tooth proximad of end on under side, this process extending distad beyond base of claw; ventrad of this are two other processes or large teeth of which the distal one, the smaller, is near base of fang, the second of these followed proximally by a larger interval and then by six teeth along the upper margin of the furrow of which the proximal five are nearer together. On the ventral side of the chelicera at base of claw a short but wide process notched at middle and more prolonged on mesal side of notch; proximad of this three longer teeth followed proximally, after a wider interval, by eight teeth decreasing in size to proximal end (figs. 89 and 90.)

Length, 5.8 mm. Length inclusive of chelicerae, 7.4 mm. Length of tibia + patella I, 7 mm.; of tibia + patella IV, 4 mm.

Type: Male, No. 1430, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 14, 1921, at Puerto Escondido, Lower California, one male taken in the Arroyo de Escondido.

A female taken at the same time and place is doubtfully the same species.

80. *Argiope argentata* Fabricius

Aranea argentata Fabricius, Ent. Syst., 1793, II, p. 414.

Argiope argentata C. Koch, Die Arachniden, 1839, V, P. 38, pl. 134, fig. 360.

Localities: San Francisquito Bay, May 10, one, June 20, two females; Tiburon Island, April 23, one female, July 5, one female; San Marcos Island, May 12, one female, June 20, two females; San Josef Island, May 28, two females; San Francisco Island, May 30, one female; Espiritu Santo Island, June 1, two males and two females; Tortuga Island, June 22, three females; Cerralbo Island, June 6, one male and one female; San Lorenzo Island, June 24, one male; Angel de la Guarda Island, June 29, two females; Pelican Island, July 6, three females.

A familiar species from the southern United States southward as far as Patagonia.

80a. *Metargiope trifasciata* Forskal

Aranea trifasciata Forskal, Descript. Anim., 1775.

Epeira fasciata, Hentz, Jour. Bost. Soc. Nat. Hist., 1847, V, p. 468, pl. 30, fig. 5.

Argiope transversa Emerton, Trans. Conn. Acad. Sci., 1885, V, p. 530, pl. 34, fig. 20; pl. 38, figs. 15-18.

Argiope argyrasfis McCook, American Spiders, 1893, III, p. 219, pl. 15, fig. 8; pl. 16, figs. 3, 4.

Metargiope trifasciata F. Cambridge, Biol. Cent. Amer. Arach., 1903, II, p. 451, pl. 18, figs. 2, 3.

Locality: Angel de la Guarda Island, June 29, one female.

This species, the familiar banded garden spider, is of world-wide distribution in tropical and subtropical regions and occurs in America from Canada to Chile.

81. *Cyclosa bifurca* McCook

Cyrtophora bifurca McCook, Proc. Acad. Nat. Sci. Phil., 1887, XXXIX, p. 342.

Cyclosa fissicauda Cambridge, Biol. Centr. Amer. Arach., 1889, I, p. 49, pl. 8, fig. 7.

Cyclosa bifurca McCook, American Spiders, 1893, III, p. 221, pl. 17, figs. 9, 10.

Localities: La Paz, June 5, three; Ceralbo Island, June 7, seven.

A species previously known from Mexico and Central America and from Florida.

82. *Cyclosa turbinata* Walckenaer

Epeira turbinata Walckenaer, Ins. Apt., 1842, II, p. 140.

Epeira caudata Hentz, Jour. Bost. Soc. Nat. Hist., 1850, VI, p. 23, pl. 3, fig. 14.

Cyclosa turbinata McCook, American Spiders, 1893, III, p. 224, pl. 17, figs. 5, 6.

Localities: Tepoca Bay, April 25, eight; La Paz, June 5, two; Isla Partida, May 22, one, July 1, seven; Tiburon Island, May 23, one; Sal si Puedes Island, May 9, one; Santa Inez Island, May 13, three; San Marcos Island, June 20, one; Ildefonso Island, May 17, five; Las Galeras Island, June 14, three; Isla Raza, June 21, numerous specimens collected by J. C. Chamberlin; May 21, five, collected by E. P. Van Duzee; Patos Island, April 23, one.

A common species throughout the United States and in Canada. It has also been taken in the Bermudas.

83. *Cyclosa walckenaeri* Cambridge

Epeira bifurcata Keyserling (*nec* Walckenaer), Sitz. Ber. Isis., 1863, p. 142, pl. 6, figs. 22, 23.

Turckheimia walckenaeri Cambridge, Biol. Centr. Amer. Arach., 1889, I, p. 47, pl. 8, fig. 1.

Cyclosa walckenaeri McCook, American Spiders, 1893, III, p. 226, pl. 17, fig. 1.

Locality: La Paz, June 5, three.

A species previously known from California and southward through Mexico and the West Indies to Central America, Colombia and Brazil.

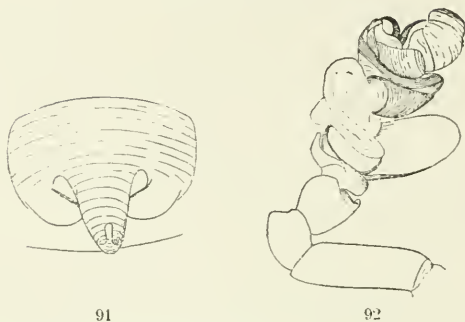
84. *Metepeira labyrinthea* HentzFig. 91. *Metepeira labyrinthea*, epigynum.

Fig. 92. Right palpus of male, ectal view.

Epeira labyrinthea Hentz, Jour. Bost. Soc. Nat. Hist., 1847, V, p. 471, pl. 31, fig. 3.

Metepeira labyrinthea F. Cambridge, Biol. Cent. Amer., Arach., 1903, II, p. 458, pl. 43, figs. 6, 7.

Localities: Tepoca Bay, April 25, one; Mejia Island, April 30, about 12; San Pedro Nolasco Island, April 17, numerous specimens; South San Lorenzo Island, April 9, one female; North San Lorenzo Island, June 24, one female; Las Galeras Island, June 13, one female; Isla Partida, July 2, several.

This familiar form, occurring in all parts of America and its islands from Labrador southward, would seem to be one of the commoner species of spiders on the islands of the Gulf of California.

85. *Aranea gemma* McCook

Epeira gemma McCook, Proc. Acad. Sci. Phil., 1888, XL, p. 193, figs. 1, 2.

Aranea gemma Comstock, Spider Book, 1912, p. 472, fig. 490.

Locality: South San Lorenzo Island, May 9, two females.

This is a large and conspicuous species familiar in the western United States but not previously recorded from within Mexico.

86. *Aranea detrimentosa* Cambridge

Epeira detrimentosa Cambridge, Biol. Centr. Amer., Arach., 1889, I., p. 26, pl. 6, fig. 7.

Epeira heidemanni Marx, Catalogue, 1889, p. 545.

Epeira tranquilla Keyserling, Spinnen Amerikas, Epeiridæ, 1892, p. 137, pl. 7, fig. 101.

Epeira nigrohumeralis Cambridge, Biol. Centr. Amer. Arach., 1893, I., p. 111, pl. 15, fig. 3.

Aranea detrimentosa Cambridge, Biol. Centr. Amer. Arach., 1904, II, p. 515, pl. 49, fig. 18.

♀ *Localities*: Tepoca Bay, April 25, one female; Pelican Island, July 6, two females; Patos Island, April 23, one male, one female.

This species is known to occur from the southern United States through Mexico to Central America.

87. *Larinia cymotypha* Chamberlin, new species



93

Fig. 93. *Larinia cymotypha*, epigynum.

Female: Carapace pale yellow with some narrow black marginal stripes and a median dorsal black line from the posterior median eyes caudad and down the posterior declivity. Sternum mostly black. Legs pale yellow; anterior femora longitudinally streaked with black on the sides, the black streaks absent from the posterior pair; patellæ and tibiæ longitudinally streaked with black above and laterally; the black on the metatarsi tending to condense into four annuli of which the distal one is longest and most pronounced. The abdomen ventrally has a black band over its entire length bordered each side with yellow and divided behind the epigastric furrow by a yellow line. The dorsum is characteristically marked with a narrow median longitudinal pale stripe which is limited on each side by a strongly wavy black line, contrasting with the straight lines in *L. directa* (Hentz), etc., this median stripe embracing a less distinct dark stripe; each side of the median pale stripe the dorsum is dusky, the pigment appearing under the lens in numerous dots, the darker area crossed longitudinally by one typically complete wavy pale line, and with two or more incomplete ones.

Abdomen narrow, similar in form to that of a Tetragnatha. Epigynum, fig. 93. Length, 7 mm., tibia + patella I, 5.2 mm.; tibia + patella IV, 4.2 mm.

Type: Female, No. 1431, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, June 30, 1921, at Pond Island Bay,

Angel de la Guarda Island, Gulf of California. *Paratype*: San Esteban Island, April 19, 1921, one immature female.

88. *Eustala anastera buliafera* Chamberlin, new sub-species

Female: Obviously close to typical *E. anastera* (Walckenaer), but differing from that and other North American species in having a distinct tubercle on each anterolateral corner of the abdomen. Caudal tubercle less pronounced than in *E. anastera conchlea* which occurs in California and is found also in Florida. It is a larger form than is usual either in typical *anastera* or in *anastera conchlea*, and has the color markings more sharply defined.

Integument of thoracic part of cephalothorax brown, the head much paler; sternum pale; femora of legs dusky or blackish excepting proximally; patellæ dark at ends; tibiæ with three black rings of which the middle is longest and the proximal one short and usually incomplete; metatarsus also with three black annuli of which the proximal is much reduced and incomplete; tarsi with distal half black. Dorsum of abdomen with a sharply defined folium behind level of tubercles and limited by a black line bordered with white; in front of tubercles a light area divided by a median longitudinal dark line; venter with a median light area behind epigastric furrow and a pair of light dots in front of spinnerets sometimes more or less clearly set off. Length, 7 mm.

Type: Female, No. 1432, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, July 2, 1921, on *Isla Partida*, Gulf of California. *Paratypes*: same data, several specimens; Tepoca Bay, April 25, one immature male; Las Galeras Islands, June 13, 1921.

89. *Eustala anastera leuca* Chamberlin, new sub-species

Female: This differs from the preceding subspecies in lacking the anterior angles or tubercles on the abdomen. It has a distinct caudal tubercle which is smaller than in the subspecies *conchlea* but better defined than in *anastera sens. str.* It is lighter throughout than the other forms; the legs lack distinct annuli, though the femora may be darkened at the distal end, especially on the dorsal side; the dorsum of the abdomen bears the usual folium, but this is obviously paler and less strongly marked; the venter is wholly pale excepting at base of spinnerets.

Apical portion of scape of epigynum ordinarily bent into a hook-like form and very similar to that of the type form.

Length, 7 mm.; abdomen, 5.2 mm.; width, 5 mm.

Type: Female, No. 1433, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, May 13, 1921, on *South Santa Inez Island*, Gulf of California. *Paratypes* in Mus. Calif. Acad. Sci., and M. C. Z., same data as type, about eight specimens.

Eustala sp.

A form represented only by immature specimens in the collection. It is light colored throughout; venter of abdomen with a black spot in middle, dorsum lacking folium; abdomen with a well-defined caudal tubercle; bearing long setæ with numerous much shorter ones intervening.

Length of largest specimen, 8.8 mm.

Localities: San Francisquito Bay, May 10; Concepcion Bay, June 17; San Marcos Island, May 12; Carmen Island, May 21.

90. Gasteracantha cancriformis Linne

Aranea cancriformis Linne, Syst. Nat., 1767, 11th ed., II, p. 1037.

Gasteracantha cancriformis C. Koch, Die Arachniden, 1838, IV., p. 21, pl. 114, fig. 263.

Epeira cancer Hentz, Jour. Bost. Soc. Nat. Hist., 1850, VI., p. 23, pl. 3, fig. 13.

Gasteracantha rufospinosa Marx, Ent. Amer., 1888, II., p. 25.

Localities: La Paz, April 11, one; San Francisco Island, May 20, many; Espiritu Santo Island, June 1, one.

This species occurs commonly from Paraguay and Brazil northward through the West Indies and Mexico into the southern section of the United States.

91. Micrathena funebris Marx

Acrosoma funebris Marx, Proc. Cal. Acad. Sci., 1898, Ser. 3, I, p. 249.

Micrathena funebris Petrunkevitch, Cat. Amer. Spiders, 1911, p. 370.

Localities: San Josef Island, May 29, June 9, 10, many; Coronados Island, May 18, six, collected by E. P. Van Duzee.

Known previously only from Lower California.

MIMETIDÆ

92. Mimetus hesperus Chamberlin

Jour. Ent. and Zool., 1923, XV., p. 5, f. 7 and 8 (adv. reprint issued July, 1922).

Locality: Patos Island, April 23, 1921, one male.

This species was previously known as occurring in the Southwestern United States, as in Texas, Utah, Arizona, and California, the range extending northward on the Pacific Coast to Washington state. Records from this region given by authors under *M. interfactor* probably all refer to this species.

THOMISIDÆ

93. *Misumenops celer* Hentz

Thomisus celer Hentz, Jour. Bost. Soc. Nat. Hist., 1847, V., p. 446, pl. 23, fig. 5.

Diaea lepida Thorell, Bull. U. S. Geol. Geog. Surv., 1877, III., p. 498.

Misumena spinosa Keyserling, Spinnen Amerikas, Laterigradæ, 1880, p. 81, pl. 2, fig. 42.

Misumena georgiana Keyserling, *ibid.*, p. 86, pl. 2, fig. 45.

Misumena californica Banks, Jour. N. Y. Ent. Soc., 1896, IV., p. 91.

Misumena decora Banks, Proc. Cal., Acad. Sci., 1898, Ser. 3, I, p. 263, pl. 16, fig. 13.

Diaea spinigera Cambridge, Biol. Centr. Amer. Arach., 1898, I., p. 241, pl. 33, fig. 16.

Misumenops spinosus F. Cambridge, *ibid.*, 1900, II., p. 144, pl. 10, fig. 6.

Misumena diegoi Keyserling, Verh. zool-bot., Ges. Wien, 1887, XXXVII., p. 481, pl. 6, fig. 41.

Misumessus pallidulus Banks, Jour. N. Y. Ent. Soc., 1904, XII., p. 112, pl. 5, fig. 8.

Localities: Guaymas, April 12, one female, E. P. Van Duzee; San Luis Gonzaga Bay, April 29, one adult male and two immature individuals; Mulegé, May 14, two immature females, E. P. Van Duzee; Loreto, one female; San Nicolas Bay, May 17, one immature female probably this species; Las Animas Bay, May 8, five females; San Francisquito Bay, May 13, several males and females; Puerto Escondido, June 14, one female; San Francisco Island, May 30, four females, E. P. Van Duzee; Ceralbo Island, June 7, one immature male probably this species; Ildefonso Island, May 18, four immature females; San Marcos Island, May 13, one female, E. P. Van Duzee; South San Lorenzo Island, May 10, three immature females; Pond Island Bay; Angel de la Guarda Island, June 30, two females and many young.

One of the females from Angel de la Guarda Island is strikingly colored, the pigment being a bright red. On the anterior legs the pigment forms bands at both ends of tibia and one on patella, at distal end of metatarsus, and occurs over part of femur as well as on coxæ beneath. It is not thought that these markings are of systematic significance, as they correspond rather closely to the dark markings normally present in the male.

This species is common in the Southern States and across the southern part of the country to California, from where it ranges northward to Washington and southward into Mexico and the West Indies. In the northeastern United States and Canada it is replaced by the closely allied *M.*

asperatus (Hentz), a species also occurring in the Southern States but there by no means so common.

M. celer is subject to considerable variation. An examination of extensive series of specimens convinces me that the names listed above are synonymous. Variations shown by the types examined can be matched in a good series from a single locality and thus do not correspond with definite geographical areas. The peculiarity in form of epigynum figured for *M. diegoi* is exhibited by sporadic specimens from different localities and is due to a transparent stage in the integument through which subjacent parts appear more distinctly.

94. *Misumenops dubius* Keyserling

Misumena dubia Keyserling, Spinnen Amerikas, Laterigradae, 1880 p. 9, pl. 2, fig. 48.

Misumena ornata Cambridge, Biol. Cntr. Amer. Arach., 1893, I., p. 119, pl. 15, figs. 11, 13.

Misumenops dubius F. Cambridge, *ibid.*, 1900, II., p. 145, pl. 10, fig. 10.

Locality: Guaymas, April 9, one female taken by E. P. Van Duzee.

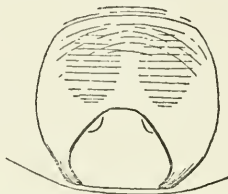
Previously known only from Guerrero and Tepic in Mexico.

Horodromus Chamberlin, new genus

Endites not acuminate, the labium distally truncate. Margins of furrow of chelicera wholly unarmed. Both rows of eyes strongly recurved, with the posterior row greatly exceeding the anterior in length. Posterior lateral eyes larger and more prominent than the anterior lateral eyes. Clypeus nearly as high as length of median ocular area. Median ocular area narrower in front than behind and about as wide behind as the length. Cephalothorax low and broad. Sternum truncate behind. Abdomen subtruncate in front and pointed behind; not elevated. Anterior legs longer than the posterior, the second pair longest. Tarsi and claws of normal form, the tarsi not at all scopulate, but with strongly developed fasciculi unguiculares of spatulate hairs. Anterior tibiae with only two pairs of ventral spines. Integument with erect setae and also with a closer covering of coarse, squamose hairs.

Genotype: *Horodromus absolutus* new species.

A philodromoid form characterized especially by the complete absence of scopulae on tarsi.

95. *Horodromus absolutus* Chamberlin, new species

94

Fig. 94. *Horodromus absolutus*, epigynum.

Female: Carapace fulvous, with a dusky band over each side and a dark mark transversely across caudal end of pars cephalica; clypeus dark under eyes, the dark area produced by numerous minute dots and divided at middle by a pale vertical stripe; chelicerae darkened in front by numerous dark dots which do not extend to lower end; sternum, labium, endites, and the coxae beneath, clear yellow; legs yellowish, with minute black dots more or less densely accumulated in larger dark spots and areas; abdomen fulvous, with a blackish sagittate mark at base above and with the sides also blackish; venter clear fulvous.

Posterior row of eyes strongly recurved; the eyes equidistant; lateral eyes much larger than the medians, their diameters being as 5:3; anterior row of eyes much shorter than the posterior (2:3), the median eyes much farther from each other than from the laterals.

Tibiae I and II with two pairs of long ventral spines, one pair at base and one at middle; with two shorter spines on anterior and two on posterior face; metatarsi I and II with three pairs of ventral spines, the apical ones shortest. Epigynum, fig. 94. Length, 6 mm.

Type: Female, No. 1434, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 4, 1921, at Nogales, Arizona. *Allotype*, Male, M. C. Z., collected at Patagonia, Arizona, in May, 1913, by R. V. Chamberlin.

96. *Ebo mexicanus* Banks

Proc. Cal. Acad. Sci., 1898, Ser. 3, I., p. 265, pl. 16, fig. 9.

Localities: Isla Raza, April 21, many; Isla Partida, April 22, many; Carmen Island, June 16, one female; Pond Island Bay, Angel de la Guarda Island, June 30, one female.

Previously recorded from Hermosillo, Mex. (type locality) and from New Mexico. The specimens here listed were secured chiefly in sweepings from *Erigeron*, *Atriplex*, etc.

97. *Thanatus peninsulae* Banks

Proc. Cal. Acad. Sci., 1898, Ser. 3, I., p. 265, pl. 16, fig. 11.

Locality: San Pedro Martir Island, April 18, one female.

Previously known from the cape region (San Jose del Cabo) of Lower California.

98. *Thanatus retentus* Chamberlin

Jour. Ent. and Zool., 1920, XII., p. 9, pl. 6, fig. 5.

Locality: Ensenada, April 7, one female.

This species is not uncommon in southern California but has not previously been recorded from elsewhere.

SELENOPIDÆ

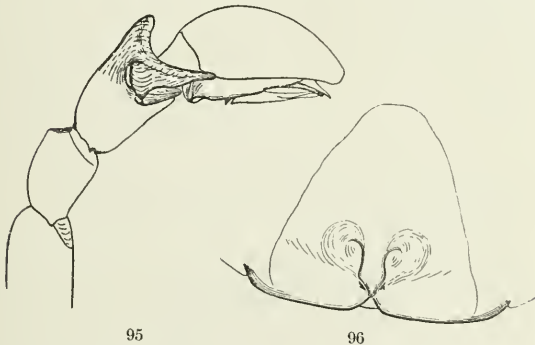
99. *Selenops actophilus* Chamberlin, new species

Fig. 95. *Selenops actophilus*, right palpus of male, ectal view.

Fig. 96. Epigynum.

Male: Coloration essentially as in *nesophilus*, but with the dark bands of the legs deeper and more sharply defined.

Posterior median eyes one-half the diameter of the anterior laterals; anterior median eyes decidedly less than their diameter apart. Ventral spines of anterior tibiae and metatarsi as in *nesophilus*. This species is separated from *nesophilus* chiefly on the basis of the differences in the palpus, such as the different form of the tibial apophysis (fig. 95). Length, 9 mm.

Female: Epigynum as shown in fig. 96. Length, 10 mm.

Type: Male, No. 1435, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, July 7, 1921, at San Carlos Bay, Sonora. *Allotype*, female, No. 1436, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, July 7, 1921, at San Pedro Bay, with egg sack. *Paratypes* in Mus. Calif. Acad. Sci., and M. C. Z., Guaymas, April 14, 1921, two immature specimens.

100. *Selenops nesophilus* Chamberlin, new species

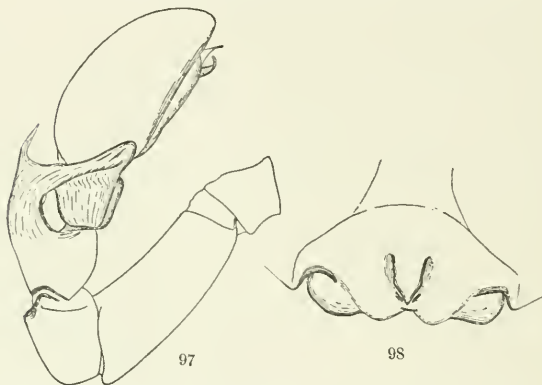


Fig. 97. *Selenops nesophilus*, right palpus of male, ectal view.

Fig. 98. Epigynum.

Female: Carapace brown, the sternum and coxæ of legs beneath more yellowish; legs light brown, femora with two dark cross bands over anterior and dorsal sides, the tibiæ with two complete dark annuli, the patellæ dark at proximal end; these annuli more pronounced in young specimens; abdomen dusky grey above, with a paler median dorsal mark at base; venter lighter grey.

Posterior median eyes less than half (14:32) the diameter of the medians to which they are closer than to the posterior laterals; anterior median eyes about their diameter apart. Tibiæ I and II with three pairs of long ventral spines of which two pairs are proximad of middle and one pair a little distad of middle; metatarsi I and II with two pairs of ventral spines of which the distal pair is near the middle. Epigynum, fig. 98. Length, 13.5 mm.

Male: Palpus as shown in fig. 97. Length, 13 mm.

Type: Female, No. 1437, and *allotype*, Male, No. 1438, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 11, 1921, on Tortuga Island, Gulf of California. *Para-*

types in Mus. Calif. Acad. Sci. and M. C. Z.; same data as type, three; Puerto Escondido, June 14, one female, E. P. Van Duzee; Isla Raza, April 21, five; Palm Cañon, Angel de la Guarda Island, May 3, one female; Santa Catalina Island, June 12, three.

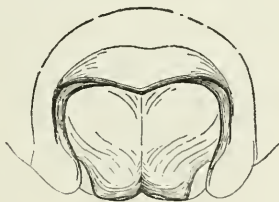
Selenops sp.

Immature specimens of *Selenops* not at present referable to their species were taken at the localities listed below.

Localities: San Pedro Bay, July 7, two; Agua Verde, May 26, four; Puerto Escondido, May 29, one; Loreto, May 19, one; Angeles Bay, May 25, two; La Paz, April 12, one; Mulegé, May 14, one; Isla Partida, April 22, two; San Pedro Nolasco Island, April 17, two, collected by J. C. Chamberlin and three by E. P. Van Duzee; San Esteban Island, April 20, four; San Pedro Martir Island, April 18, five; Monserrate Island, May 25, two; Danzante Island, May 24, two; San Josef Island, May 28, two; Carmen Island, May 21, one; Santa Inez, May 13, one; Sal si Puedes Island, May 9, five; San Francisco Island, May 30, one; Ildefonso Island, May 17, one; Ceralbo Island, June 8, one; Concepcion Bay, June 17, one; North San Lorenzo Island, June 24, two; San Marcos Island, June 20, one; Smiths Island, June 27, two.; Willard's Point Bay, Tiburon Island, July 3, four.

HETEROPODIDÆ

101. *Olios positivus* Chamberlin, new species



99

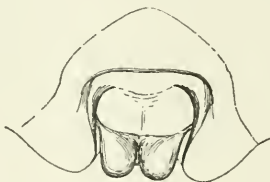
Fig. 99. *Olios positivus*, epigynum.

Female: Carapace dull yellow; sternum a lighter yellow; legs dull yellow above, a lighter yellow beneath; abdomen a dull or greyish yellow above, lighter beneath.

Anterior median eyes clearly less than their diameter from each other, nearer to the laterals, larger than the posterior medians; eyes of posterior row equidistant, the separation of each adjacent two being about twice the diameter of an eye. Characterized especially by the form of the epigynum, which is represented in fig. 99. Length, 8.5 mm.

Type: Female, No. 1439, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 30, 1921, on **San Francisco Island, Gulf of California**, together with two immature females.

102. *Olios scepticus* Chamberlin, new species



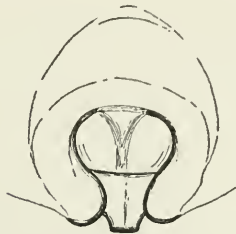
100

Fig. 100. *Olios scepticus*, epigynum.

Female: Carapace and chelicerae yellow of a somewhat reddish cast; sternum and coxae of legs beneath clear yellow; legs yellow, lighter below than above, especially the femora, as usual, finely dotted with brown; abdomen with lateral region of dorsum and the sides spotted with brown, the usual light mark at base above and the median dark line behind; venter immaculate.

Anterior median eyes larger than the laterals (diameters 17:15); separated from each other by less than their diameter (14:17) and about their radius from the laterals; eyes of posterior row essentially equidistant. Epigynum fig. 100. Length, 10 mm.

Type: Female, No. 1440, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 6, 1921, on **Ceralbo Island, Gulf of California**. *Paratype*, same data, one female.

103. *Olios naturalisticus* Chamberlin new species

101

Fig. 101. *Olios naturalisticus*, epigynum.

Female: Carapace yellowish, with longitudinal streaks of reddish brown on sides and posterior region of pars cephalica, and a similar brown stripe over anterior eye row and extending down to each anterolateral corner; sternum and coxæ of legs beneath clear yellow; legs yellow, darker above than below, spotted with brown, particularly on femora and tibiæ, the spots on the latter tending to form an annulus at base; abdomen above greyish yellow, spotted along sides with brown and spots also outlining a clear median mark at base, a narrow median longitudinal dark stripe posteriorly; venter lighter yellow, more weakly spotted behind.

Anterior median eyes a little larger than the laterals (17:15), separated from each other by about three-fourths their diameter, a little nearer to the laterals; posterior median eyes twice their diameter apart, nearer to the laterals. Epigynum as shown in fig. 101. Length, 10 mm.

Type: Female, No. 1441, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, July 4, 1921, at southern end of Tiburon Island, Gulf of California. *Paratypes*: Patos Island, April 23, 1921, three immature specimens.

104. *Olios pragmaticus* Chamberlin, new species

102

Fig. 102. *Olios pragmaticus*, epigynum.

Female: Carapace fulvous; sternum, coxæ and femora of legs beneath yellow; legs elsewhere fulvous, the tarsus and metatarsus darkened with dense scopulæ;

chelicerae black; abdomen above greyish yellow, with a sagittate outline at base followed by a median dorsal black line which is beaded; venter lighter yellow, immaculate.

Lower margin of furrow of chelicera with four teeth. Anterior median eyes only slightly larger than the laterals (about as 25:24), nearly three-fourths their diameter apart and not fully half as far from the laterals; posterior median eyes nearer to each other than to the laterals. Epigynum, fig. 102.

Length, 15.5 mm.

Type: Female, No. 1442, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 9, 1921, on **South San Lorenzo Island, Gulf of California** (with slight doubt). *Paratype*, M. C. Z. North San Lorenzo Island, May 25, 1921, one female with young.

Olios sp.

Immature specimens were taken at the localities listed below.

Localities: San Pedro Bay, July 7, one; San Carlos Bay, July 8, two; Tepoca Bay, April 25, one; La Paz, April 12, one; Angeles Bay, May 6, two; Tortuga Island, June 22, one, collected by E. P. Van Duzee; Angel de la Guarda Island, May 1, one; Ceralbo Island, June 7, one; Salinas Bay, Carmen Island, June 16, one.

CTENIDÆ

105. *Ctenus hybernalis* Hentz

Jour. Bost. Soc. Nat. Hist., 1844, IV, p. 393, pl. 19, figs. 1-4.

Two immature specimens, one from each locality given below, are referred with little doubt to this species.

Localities: San Pedro Bay, July 7; Tiburon Island, July 5.

This species occurs in the southern United States, Mexico, the West Indies, and possibly in South America.

CLUBIONIDÆ

106. *Chiracanthium inclusum* Hentz

Clubiona inclusa Hentz, Jour. Bost. Soc. Nat. Hist., 1847, V, p. 451, pl. 23, fig. 18.

Chiracanthium viride Emerton, Trans. Conn. Acad. Sci., 1889, VIII, p. 184, pl. 5, fig. 12.

Chiracanthium inclusum Simon, Proc. Zool. Soc., London, 1897, p. 878.

Locality: Pond Island Bay, Angel de la Guarda Island, June 30, one female in a nest made between leaves held together by silk.

This species is widespread in the United States and occurs as well in Mexico and through the West Indies.

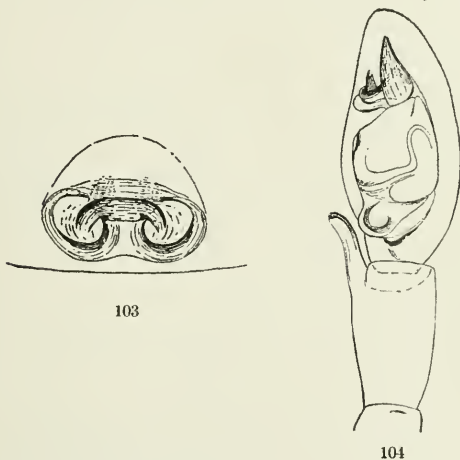
107. *Gayenna absoluta* Chamberlin, new species

Fig. 103. *Gayenna absoluta*, epigynum.

Fig. 104. Right palpus of male.

Female: Carapace dull brownish yellow; sternum and legs yellow; abdomen grey, with indistinct chevron marks on posterior portion of dorsum.

Posterior row of eyes a little procurved; median eyes about their diameter apart, a little nearer to the laterals; anterior median eyes less than their diameter apart, much closer to the larger lateral eyes.

Tibia I and metatarsus I with two pairs of spines beneath, one pair at base and one near middle. Posterior spiracle nearly midway between epigastric furrow and the spinnerets. Epigynum as shown in fig. 103. Length, 3.2 mm.

Male: Palpus as shown in fig. 104.

Length, 3 mm.

Type: Female, No. 1443, and *allotype*, male, No. 1444, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 17, 1921, at the little bay south of Guadalupe Point on the easterly shore of **Concepcion Bay, Lower California.**

Paratypes: Mus. Calif. Acad. Sci. and M. C. Z., same data as type, four.

108. *Anyphæna johnstoni* Chamberlin, new species

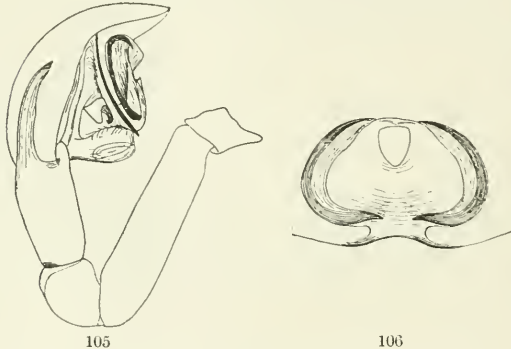


Fig. 105. *Anyphæna johnstoni*, right palpus of male, ectal view.

Fig. 106. Epigynum.

Female: Carapace fulvous, clypeus and part of eye region dusky; sternum and legs yellow; chelicerae black; abdomen grey laterally and at sides of dorsum, the middorsal region clearer yellow; venter with two, rather weak, longitudinal darker lines ending at the spiracle.

Anterior row of eyes straight or nearly so; eyes subequal, the medians separated by about their radius, closer to the laterals; posterior row of eyes a little procurved, its eyes equal and nearly equidistant, or the medians slightly farther from each other than from the laterals; lateral eyes on each side less than their radius apart. Metatarsi I and II with a pair of ventral spines at base. Tibia I with two pairs of spines beneath, one at base and one submedian, or the caudal spine of each pair missing; tibia II with a single sub-

median ventral spine. Posterior spiracle plainly in front of middle of abdomen. Epigynum, fig. 106. Length, 7 mm.

Male: Coloration as in the female. Both tibia I and tibia II with two pairs of spines beneath. Palpus, fig. 105. Length, 6.5 mm.

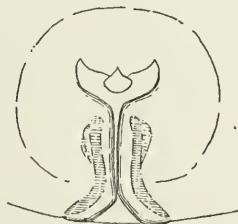
Type: Female, No. 1445, and *allotype*, male, No. 1446, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 17, 1921, on **San Pedro Nolasco Island, Gulf of California**. A male and female taken in a nest together under the loose-peeling bark of a tree identified by I. M. Johnston, who aided in the collecting, as *Acacia willardiana* Rose. The spider is said in a field note to match the color of the bark of this tree. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z.; Puerto Escondido, June 14, one male; San Marcos Island, May 12, two males swept from bushes by E. P. Van Duzee.

Anyphæna sp.

Immature specimens of uncertain species.

Locality; Concepcion Bay, June 17.

109. *Syspira analytica* Chamberlin, new species



107

Fig. 107. *Syspira analytica*, epigynum.

Female: Carapace with the usual wide median dorsal stripe, this fulvous, more reddish in head region; marginal stripes yellow, side bands black; sternum and coxæ of legs beneath brownish; legs a lighter brown, the femora much lighter beneath, all joints without trace of annuli; abdomen grey, the mid-dorsal region lighter, more yellowish.

Anterior row of eyes straight, the median eyes not at all larger than the laterals. Posterior laterals decidedly larger than the anterior laterals from which they are removed by less than their diameter. Epigynum, fig. 107.

Length, 15 mm.

Type: Female, No. 1447, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 9, 1921, on **Ballena Island, Gulf of California**. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z.; same data as type, four immature specimens; Angeles Bay, June 27, one female; Guaymas, April 14, one female; Ildefonso Island, May 17, several immature; West Las Galeras Island, June 13, one adult female and several immature.

This species differs from *S. tigrina* and *S. longipes* of Simon in having the anterior median eyes not at all larger than the laterals instead of clearly exceeding them.

110. *Syspira eclecticica* Chamberlin, new species

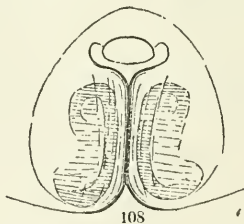


Fig. 108. *Syspira eclecticica*, epigynum.

Female: Carapace yellow, dusky over sides and dorsum, leaving a clearer yellow marginal border on each side but without the usual sharply defined median dorsal stripe; sternum and coxæ of legs beneath clear yellow; legs yellow, the femora with cross marks of dark above; abdomen dusky grey above, greyish yellow beneath.

Anterior row of eyes straight; median eyes much larger than the laterals, the ratio of diameters nearly as 11:8, separated from each other by less than their radius and nearly contiguous with the laterals; posterior lateral eyes much larger than the anterior laterals and separated from them by much less than their diameter; area of median eyes wider in front than behind (about as 23:21). Spining of legs as usual. Epigynum, fig. 108. Length, 14.5 mm.

Type: Female, No. 1448, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 10, 1921, on **San Josef Island, Gulf of California**. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z.; same data as type, two females, one male, immature; Isla Partida, June 25, one; South Santa Inez Island, May 13, one, E. P. Van Duzee.

This form seems obviously distinct from the other species in its eye relations. In the relative proportions of the anterior eyes it suggests *S. tigrina* Simon, but the lateral eyes on each side are decidedly less than their diameter apart instead of being much more than this distance from each other.

III. *Syspira synthetica* Chamberlin, new species

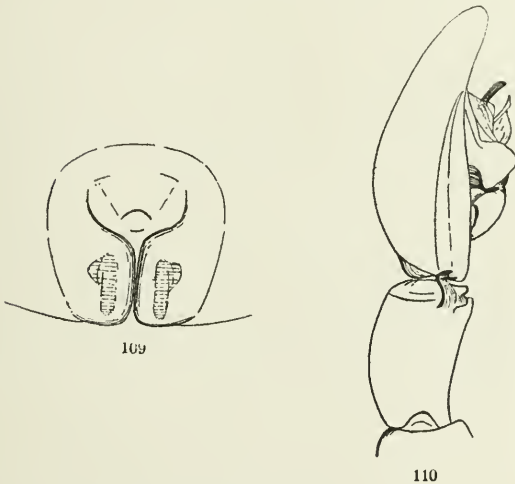


Fig. 109. *Syspira synthetica*, epigynum.

Fig. 110. Right palpus of male, ectal view.

Syspira tigrina Banks (not of Simon), Proc. Cal. Acad. Sci., 1898, Ser. 3, I, p. 226.

Syspira longipes Banks (not of Simon), *ibid.*, p. 227.

Female: Coloration in general similar to that of *analytica* but integument of median stripe of carapace and that of sternum without a reddish cast; dorsum of abdomen sometimes showing many black spots on each side; legs differing from those of *analytica* in being conspicuously annulate with black; two bands on femora, incomplete on anterior pairs but with the more distal one typically complete on the posterior pairs; tibiae III and IV with a conspicuous annulus at base, that of the fourth more strongly marked, and commonly a less obvious one toward distal end.

Anterior row of eyes slightly procurved, the medians, if any different, slightly smaller than the laterals; laterals less than their diameter apart, the posterior a little the larger. Epigynum, fig. 109. Length, 12 mm.

Male: Palpus, fig. 110. Length, 9.5 mm.

Type: Female, No. 1449, and *allotype*, male, No. 1450, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 23, 1921, on **Patos Island, Gulf of California**. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z. (male, female); Guaymas, April 9, ten, E. P. Van Duzee; San Francisquito Bay, May 10, one, immature; Puerto Escondido, June 14, one male; San Jose del Cabo, several, male and female (M. C. Z.); Pelican Island, July 6, three, immature; San Josef Island, June 10, three; East Las Galeras Island, June 13, three, immature; Mejia Island, April 30, two, immature.

Like *analytica*, this species differs from the two described from Lower California by Simon in not having the anterior median eyes larger than the laterals. A smaller form than *analytica* differing at sight in the annulation of the legs which shows in all stages of development. The epigyna of these species differ in the form of the tubes.

112. *Syspira longipes* Simon

Bull. Soc. Zool. de France, 1895, p. 136.

Locality: Guaymas, April 12, one immature male taken by E. P. Van Duzee.

This specimen, though immature, is referred to *S. longipes* largely because of agreement in the exceptionally large size of the anterior median eyes.

Syspira sp.

Immature specimens not referable with certainty to species were taken at the localities listed below.

Localities: San Pedro Bay, July 7, one; Guaymas, April 14, four; Arroyo de Gua, 10-15 miles north of Loreto, May 29, two; Agua Verde Bay, May 26, two; Angeles Bay, June 25, one; Loreto, May 19, one; Las Animas Bay, May 8, one; Santa Inez Island, May 13, four; Pond Island Bay, Angel de la Guarda Island, June 30, two; North San Lorenzo Island, June 24, one; Puerto Ballandra, Carmen Island, May 21, two; San Diego Island, May 27, two; Sal si Puedes Island, May 9, two; Tiburon Island, July 3, 5, three; Espiritu Santo Island, June 1, three; Santa Cruz Island, May 11, two females; Ceralbo Island, June 5, six; Ildefonso Island, May 17, one.

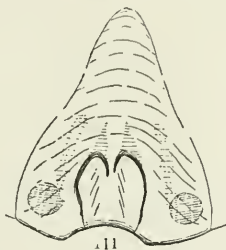
113. *Chemmis monisticus* Chamberlin, new species

Fig. 111. *Chemmis monisticus*, epigynum.

Female: Sides of carapace chocolate brown, the border on each side yellowish, enclosing a series of marginal dark spots; a median dorsal reddish yellow stripe as wide anteriorly as the eye area and there enclosing a pair of dark spots; sternum and coxæ of legs beneath pale yellowish brown; chelicerae, labium and endites dark chocolate, the two latter paler across distal ends. Legs brown; femora with a wide dark band at middle and a similar one at distal end; patella mostly covered with a broad black annulus, and the tibia with two; entire metatarsi dark. Abdomen above and laterally nearly black, a median longitudinal pale line or stripe crossed by pale chevrons excepting toward spinnerets and at extreme anterior end; venter yellow, with a pair of longitudinal dusky stripes; the sides of abdomen with black broken into numerous dots.

Lower margin of furrow of chelicera with two teeth, the upper with three. Spines of legs normal. Epigynum as shown in fig. 111. Length, 10.5 mm.

Type: Female, No. 1451, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, July 7, 1921, at San Pedro Bay, Sonora.

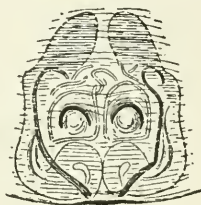
Distinguished clearly from *C. frederici* Simon in the form of the epigynum as well as in the color pattern.

114. *Anachemmis sober* Chamberlin

Jour. Ent. and Zool., 1920, XII, p. 13, pl. 5, fig. 5.

Locality: Ensenada, April 7, one immature female apparently this species. Previously known from southern California, near Claremont.

115. *Trachelas speciosus* Banks



112

Fig. 112. *Trachelas speciosus*, epigynum.

Proc. Cal. Acad. Sci., 1898, ser. 3, I, p. 225, pl. 14, fig. 32.

Localities: Angeles Bay, May 5, three females; Las Animas Bay, May 8, two females taken by V. Owen and J. C. Chamberlin at a fresh-water well a mile from the beach; Mulegé, May 14, one female; Tiburon Island, July 5, one female.

This species was described from Magdalena Island and El Taste. It has not previously been recorded from elsewhere, but it is quite likely widespread about the Gulf of California; most of the immature specimens recorded below probably pertaining to it.

Trachelas sp.

Immature specimens not specifically identifiable.

Localities: Angeles Bay, May 6, one; San Francisquito Bay, May 10, two; San Evaristo Bay, May 10, one; Puerto Escondido, June 14, one.

116. *Corinna epicureana* Chamberlin, new species

113

Fig. 113. *Corinna epicureana*, right male palpus, ectal view.

Male: Carapace light brown, dusky over anterior portion of head. Chelicerae blackish; sternum somewhat reddish yellow; legs yellow; abdomen yellowish grey.

Anterior row of eyes slightly procurved, median eyes about their radius apart, closer to the smaller laterals; posterior row of eyes nearly straight; median eyes clearly nearer to each other than to the laterals. Lower margin of the furrow of chelicera with five teeth. Metatarsi I and II armed below with two pairs of spines; tibia I armed with four pairs of ventral spines; tibia II with three pairs of ventral spines. Palpus, fig. 113. Length, 5 mm.

Type: Male, No. 1452, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, July 8, 1921, at **San Carlos Bay, Sonora.**

***Corinna* sp.**

Locality: Angeles Bay, May 6, one immature female of uncertain species.

AGELENIDÆ

117. *Cybaeus tardatus* (Chamberlin)

Parauximus tardatus Chamberlin, Jour. Ent. and Zool., 1920, XII, p. 3, pl. 1, fig. 2.

Locality: Ensenada, April 7, one male.

Known previously from the type, which was taken at Claremont, Cal.

118. *Agelena nævia* Walckenaer

Ins. Apt., 1837, 2, p. 24.

Locality: Ensenada, April 7, one female.

***Agelena* sp.**

Immature specimens not certainly referable to their species.

Localities: Angeles Bay, May 5; Las Animas Bay, May 8; La Paz, April 11; South San Lorenzo Island, May 9; Pond Island Bay, Angel de la Guarda Island, May 3; San Esteban Island, April 20; Carmen Island, May 21.

119. *Chorizomma californicum* Simon

Bull. Soc. Zool. Fr., 1895, XX, p. 136.

Locality: Ensenada, April 7, one female.

***Cœlotes* sp.**

An immature female not referable to its species.

Locality: South San Lorenzo Island, May 9.

LYCOSIDÆ

120. *Pardosa sternalis* Thorell

Lycosa sternalis Thorell, Bull. U. S. Geol. Geog. Survey, 1877, III, p. 504.

Pardosa coloradensis Banks, Jour. N. Y. Ent. Soc., 1894, II, p. 51.

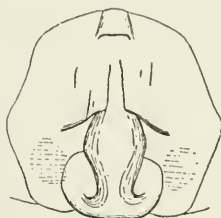
Pardosa peninsulana Banks, Proc. Cal. Acad. Sci., 1898, Ser. 3, I, p. 275, pl. 16, fig. 22.

Lycosa seydi Strand, Jahrb. Nassau Ver. Naturh., 1908, LXI, p. 258.

Locality: La Paz, two females.

Cotypes of *P. peninsulanus* Banks in the M. C. Z. are this species. They were taken at San Jose del Cabo, Lower California.

This is a very common species in the western United States.

121. *Pardosa orthodox* new species

114

Fig. 114. *Pardosa orthodox*, epigynum.

Female: Carapace black, with a median, dagger-shaped, yellow or orange stripe which is narrowly produced between the posterior eyes, and a supra-marginal stripe of yellow on each side and over clypeus, a dark mark on clypeus below eyes on each side; chelicerae somewhat orange. Sternum and coxae beneath clear yellow. Femora clear yellow below but with distinct cross bands of black dorsally, the more distal joints dusky over yellow. Dorsum of abdomen black with a yellow sagittate mark at base followed by pairs of ocellate yellow spots which, excepting the first one or two, are united mesally to form cross-marks. Venter clear yellow.

Anterior row of eyes procurved, equal in length to distance between centers of eyes of second row; medians greatly exceeding the laterals in size, separated from each other by about three fourths their diameter and from the laterals by less than their radius. Upper margin of furrow of chelicera with two teeth, the lower with three, of which the most proximal is much reduced. Epigynum, fig. 114. Length, 5.5 mm.

Type: Female, No. 1453, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 14, 1921, at Mulegé, Lower California. *Paratype* in M. C. Z.; same data, one female.

A species belonging in the *sternalis* group and distinguishable most easily by the form of the epigynum.

122. *Pardosa sabulosa* Banks

Pardosa sabulosa Banks, Proc. Cal. Acad. Sci., 1898, Ser. 3, I, p. 273, pl. 16, fig. 28.

Pardosa sierra Banks, *ibid.*, p. 274, pl. 16, fig. 20.

Localities: Angeles Bay, June 25, 27, about a dozen females, several of which are immature; Mulegé, May 14, one female taken by E. P. Van Duzee; Puerto Escondido, June 14, about twelve specimens; San Marcos Island, May 12, one adult and two immature females.

Comparison of cotypes of *P. sabulosa* and *P. sierra* in the M. C. Z. shows them to present no specific differences. The species is known only from Lower California and the adjacent islands.

123. *Lycosa concolor* Banks

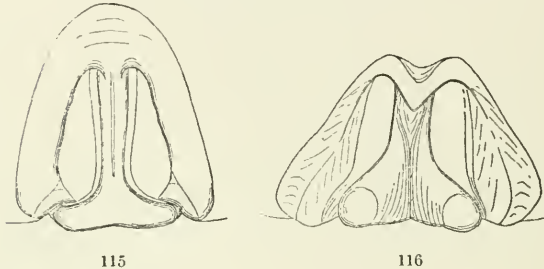


Fig. 115. *Lycosa concolor*, epigynum of specimen from Mulegé.
 Fig. 116. Epigynum of a not fully mature female from Tortuga Island, more enlarged.

Lycosa concolor Banks, Proc. Cal. Acad. Sci., 1898, Ser. 3, 1, p. 269, pl. 16, fig. 25 (immature.)

Lycosa fersimilis Banks, *ibid.*, p. 270, pl. 17, fig. 2.

Female: Carapace brown, with a median dorsal lighter stripe narrowing forward between the eyes and a light supramarginal stripe on each side; sternum and coxæ of legs beneath blackish; chelicerae also black or mahogany colored. Legs light brown, with tibiae IV black at both ends and femur IV with several black spots above. Dorsum of abdomen dark, with a light colored basal mark and some oblique light lines at its side and forming a few chevrons behind it; sides of abdomen light, and the venter solid black.

The anterior row of eyes much shorter than the second; procurved; median eyes nearly their radius apart and an equal distance from the laterals, which are smaller and are less than their diameter from the lower margin of the clypeus.

Upper and lower margins of furrow of chelicera each with three teeth. Tibiae III and IV each with two median dorsal spines. Epigynum, adult, fig. 115; immature, fig. 116.

Length, 20 mm.; cephalothorax, 10.2 mm.; tibia + patella IV, 11 mm.

Localities: Angeles Bay, June 25, one not quite mature female; Tortuga Island, May 11, two adult males and seven mostly immature females taken by E. P. Van Duzee and J. C. Chamberlin.

The type of *L. concolor* was obviously not fully mature as judged from the drawing of its epigynum, which represents the stage shown in fig. 116. The matured epigynum is of the form shown in fig. 115. The species occurs also on the eastern side of the Gulf of California (Tepic).

124. *Lycosa carolinensis* Walckenaer

Ins. Apt., 1837, I, p. 285.

Localities: Nogales, Arizona, April 3, one immature male, E. P. Van Duzee; Guaymas, April 14, one; San Nicolas Bay, May 16, one immature male.

The specimen from Nogales has the venter mostly pale. The one from San Nicolas Bay, which was taken from an 8 in. burrow, has the venter black in front of the epigastric furrow and in a median band extending back to the spinnerets. The individual from Guaymas, which was also taken from its tunnel, has the venter colored similarly to the preceding but with the median band narrower, more line-like.

125. *Arctosa littoralis* Hentz

Lycosa littoralis Hentz, Bost. Soc. Nat. Hist., 1844, IV, p. 388, pl. 17, fig. 9.

Lycosa maritima Hentz, *ibid.*, p. 389, pl. 17, fig. 10.

Lycosa cinerea Emerton (*nec* Fabricius), Trans. Conn. Acad. Sci., 1885, VI, p. 488, pl. 47, fig. 3.

Lycosa cinerea Chamberlin (*nec* Fabricius), Proc. Acad. Nat. Sci., Phil., 1908, LX, p. 305, pl. 20, fig. 6, but not fig. 5.

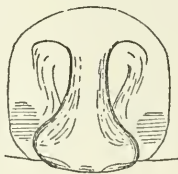
Localities: San Pedro Bay, July 7; Mulegé, May 14, one adult female and several immature specimens; Angeles Bay, June 25, numerous males and females; El Candeleros Bay, Espiritu Santo Island, May 9.

American authors have uniformly followed Emerton in an erroneous identification of our common American *Arctosa* with the European form named *Aranea cinerea* by Fabricius and subsequently called *Lycosa lynx* by Hahn and *Lycosa allodroma* by Walckenaer. A brief comparison of the copulatory organs of the American and European forms is sufficient to show conspicuous differences. Thus in the epigynum of the true *cinerea* the median septum is a simple ridge

acutely pointed behind, with no cross piece, thus leaving the lateral cavities widely open posteriorly. In the American form the septum has an always strongly developed caudal expansion or cross piece so that it appears inversely T-shaped or anchor shaped. Equally clear differences are presented by the palpi. Accordingly Hentz's name *littoralis* is here adopted for the American form.

The large series of specimens taken at Angeles Bay, was collected at night on the beach at the high tide level. Some of these are said to have been feeding on copepods.

126. *Sosippus pragmaticus* Chamberlin, new species



117

Fig. 117. *Sosippus pragmaticus*, epigynum.

Female: Under alcohol the carapace is chocolate brown, with a fine median longitudinal light line and a wider light band above each lateral margin, these light bands clothed with white hair; chelicerae black; sternum yellowish brown; legs also yellowish brown, indistinctly marked, or imperfectly ringed with dark, but these markings usually vague.

Abdomen light colored below, more greyish brown on the sides and above, but with numerous fine light dots and a longitudinal median dorsal, deep brown, stripe crossed behind by pale chevron lines that have their ends on light spots; some corresponding light spots anteriorly are without the connecting chevrons; these chevrons and spots and the sides of dorsum adjacent to the median band are clothed in life with white hair.

Anterior row of eyes procurved; median eyes larger than the laterals, their radius or a little more apart and nearly twice as far from the laterals.

Lower margin of furrow of chelicera with only three teeth of which the middle one is smallest. Upper margin of furrow with three teeth. Epigynum, fig. 117. Length, 17 mm.

Type: Female, No. 1454, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, July 8, 1921, at San Carlos Bay,

Sonora. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z.; same data as type, four, mostly immature; San Pedro Bay, July 7.

This is a larger species than *S. floridanus* and differs in having only three teeth on the lower margin of the furrow of the chelicera instead of four. It differs from *S. californicus* Simon in having the anterior median eyes larger than the laterals. The field notes indicate that this species conforms to the general web building habits of the genus, the web being of the type constructed by agelenids. The egg-sac is not attached to the spinnerets as usual in the Lycosidæ.

OXYOPIDÆ

127. *Peucetia viridans* Hentz

Oxyopes viridans Hentz, Jour. Bost. Soc. Nat. Hist., 1845, V, p. 195, pl. 17, f. 2.

Peucetia aurora McCook, Ann. and Mag. Nat. Hist., 1883, Ser. 5, XIII, p. 231.

Localities: Concepcion Bay, June 17, 1921, many, mostly immature, "collected at the little bay south of Point Guadalupe;" Mulegé, May 14, 1921, three immature, E. P. Van Duzee; Puerto Escondido, June 14, 1921, one; San Marcos Island, May 12, 1921, two swept from bushes by E. P. Van Duzee; June 19, three; Puerto Ballandra, Carmen Island, May 21, 1921, six; Marquer Bay, Carmen Island, May 23, 1921, one; Pond Island, July 2, 1921, two immature.

An abundant species across the southern United States and found also in the West Indies and as far south as Central America.

128. *Oxyopes actophilus* Chamberlin, new species

Female: Carapace black on the sides, clypeus, and in the eye-region; a wide median dorsal yellow stripe which sends a narrow tongue on each side forward beneath the lateral eye and more or less connected with a vertical stripe on each side of clypeus which also is crossed by a vertical median yellow line; a yellow band along each lateral border more or less broken by black lines from black area of side; sternum yellow. Legs with general color yellow; with femora mostly black except proximally where the black is broken; tibiæ also largely black and metatarsi with three black annuli. Dorsum of abdomen yellow, with a blackish median dorsal sagittate mark which is narrow

and ends acutely midway between middle and spinnerets; sides black; venter yellow, with two longitudinal black lines united behind in a black area adjacent to spinnerets.

Abdomen rather narrow, narrowing caudad from middle. Length, 3 mm.

Type: Immature female, No. 1455, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 11, 1921, on **Tortuga Island, Gulf of California**. *Paratypes*: San Francisquito Bay, May 10, one; Coronados Island, May 18, one immature female.

129. *Oxyopeidon absolutum* Chamberlin, new species

Female: Carapace black, somewhat lighter, more brownish, above; sternum and coxæ of legs beneath yellow; femora of legs yellow, with anterior surface, at least at distal end, black; patellæ, tibiæ and metatarsi blackish; abdomen blackish above and laterally, a light spot of whitish scales on each side of dorsum; venter and lower part of anterior face of abdomen clear yellow.

Anterior row of eyes strongly recurved, the eyes equidistant. Cephalothorax high behind, the posterior declivity vertical or nearly so, but the dorsal line highest at posterior eyes.

Abdomen of moderate length, subacutely narrowed from the middle caudad, the spinnerets at caudal end. Length, 5 mm.

Type: Immature female, No. 1456, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 19, 1921, on **San Esteban Island, Gulf of California**. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z.; same data as type, 13 immature females; Concepcion Bay, June 17, one immature female; Puerto Escondido, June 14, one immature female; Palm Cañon, Angel de la Guarda Island, May 3, one immature female; San Josef Island, June 10, four immature females.

130. *Oxyopeidon absolutum obliquum* Chamberlin, new subspecies

Female (immature): Differs from the type form in coloration. The carapace presents a conspicuous white stripe running obliquely up the side of the clypeus and backward to the posterior declivity on each side. This stripe is bordered below by a deep black band above the lighter border.

Length, 4.2 mm.

Type: Immature female, No. 1457, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 18, 1921, on **Coronados Island, Gulf of California.**

131. *Hamataliwa positiva* Chamberlin, new species



118

Fig. 118. *Hamataliwa positiva*, epigynum.

Female: Carapace brown, dusky over sides and in eye-region, clothed throughout with grey hair; sternum and legs light brown. Integument of abdomen brown, with a median dorsal dark stripe and some chevron marks behind; sides dusky; venter much lighter at sides, with a median brown band behind epigynum that ends in a point at spinnerets; abdomen clothed with grey hair.

Eyes in general as in *H. grisea*. Epigynum, fig. 118. Length, 9 mm.

Type: Female, No. 1458, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, July 7, 1921, at **San Carlos Bay, Sonora.**

In size, coloration, and general appearance resembling *H. grisea* Keyserling, but readily distinguished by the different form of the epigynum.

***Hamataliwa* sp.**

Two immature specimens which cannot certainly be placed in their species.

Locality: Tortuga Island, June 22.

ATTIDÆ

132. *Thiodina sylvana* Hentz

Attus sylvanus Hentz, Jour. Bost. Soc. Nat. Hist., 1845, V, p. 364, pl. 22, fig. 10.

Attus retarius Hentz, *ibid.*, 1850, VI, p. 288, pl. 10, fig. 11.

Thiodina sylvana Peckham, Trans. Wisc. Acad. Sci., 1909, XVI, p. 450, pl. 35, fig. 9.

Localities: San Carlos Bay, July 8, one immature female, E. P. Van Duzee; Las Animas Bay, May 8, one; Concepcion Bay, June 18, one; Angeles Bay, June 27, one; Tiburon Island, July 5, two.

A species found across the southern section of the United States and southward through Mexico and the West Indies to Panama.

133. *Salticus scenicus* (Clerck)

Araneus scenicus Clerck, Aran. Svec., 1757, p. 117.

Salticus scenicus Latreille, Nouv. Dict. Hist. Nat., 1804, XXIV, p. 135.

Locality: Guaymas, April 14, one.

This species occurs in Europe and Africa as well as throughout North America.

134. *Salticus palpalis* (Banks)

Eptiblemum palpalis Banks, Proc. Cal. Acad. Sci., 1904, Ser. 3, III, p. 360, pl. 39, fig. 31.

Salticus palpalis Peckham, Trans. Wisc. Acad. Sci., 1909, XVI, p. 477, pl. 42, figs. 10-10a; pl. 44, figs. 7-7a.

Locality: San Luis Gonzaga Bay, April 29, one.

Previously known from California.

135. *Marpissa californica* Peckham

Marpissa californica Peckham, Trans. Wisc. Acad. Sci., 1888, VII, p. 81, pl. 1, fig. 61; pl. 5, fig. 61; pl. 6, fig. 61.

Marpissa minor F. Cambridge, Biol. Centr. Amer. Arach., 1901, II, p. 250, pl. 22, figs. 5, 6.

Marpissa californica Peckham, Trans. Wisc. Acad. Sci., 1909, XVI, p. 482, pl. 39, fig. 2; pl. 40, fig. 2.

Localities: Angeles Bay, May 5, one; Las Animas Bay, May 8, one; San Francisquito Bay, May 10, one; Agua Verde Bay, May 26, one; South San Lorenzo Island, May 9, one; Coronados Island, May 18, one; Puerto Ballandra, Carmen Island, May 21, one; Espiritu Santo Island, June 8, one.

A species ranging from Central America northward to Utah and Oregon.

136. *Menemerus bivittatus* Dufour

Salticus bivittatus Dufour, Ann. Sci. Nat., 1831, p. 15, pl. 2, fig. 5.

Salticus melanognathus Lucas, Hist. Iles Canar., 1839, II, p. 29, pl. 7, fig. 4.

Menemerus bivittatus Simon, Hist. Nat. Ar., 1901, II, p. 603-604, 611.

Marpissa melanognatha Peckham, Trans. Wisc. Acad. Sci., 1909, XVI, p. 483, pl. 39, fig. 3; pl. 11, fig. 3. (See this reference for full synonymy.)

Locality: Guaymas, April 14, one female.

A cosmopolitan species.

137. *Icius vitis* Cockerell

Dendryphantès vitis Cockerell, Entomologist, 1894, XXVII, p. 207.

Icius vitis Peckham, Trans. Wisc. Acad. Sci., 1909, XVI, p. 501, pl. 40, fig. 11, pl. 41, fig. 7.

Locality: Mulegé, May 14, several.

A species widespread in the southwestern United States and also previously known from Mexico.

138. *Icius ildefonsus* Chamberlin, new species



119

Fig. 119. *Icius ildefonsus*, epigynum.

Female: Carapace black, clothed sparsely with white hairs. Legs yellow; femora and tibiae with a black longitudinal line on anterior side, that on second

pair, however, present only at distal end; a similar line on posterior side of femora, but this restricted to distal end excepting on first pair; a black line also on posterior side of tibia I; sternum and chelicerae black. Abdomen black beneath and on the sides; dorsum with a white longitudinal band on each side and a black median band, which is notched on the sides, across the posterior portion in particular. Epigynum, fig. 119. Length, 4 mm. Cephalothorax, 1.9 mm.

Type: Female, No. 1459, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 17, 1921, on Ildefonso Island, Gulf of California. Swept from bushes.

139. *Wala poenitens* Chamberlin, new species



120



121

Fig. 120. *Wala poenitens*, right palpus of male, ventral view.

Fig. 121. Tibia and base of tarsus of same, ectal view.

Male: Carapace dark, the upper part of each side forward to area beneath anterior lateral eye in front clothed with white hair which is densest anteriorly. First legs dark brown or blackish, the others yellow, without markings; sternum dark. Abdomen deep black beneath and on the sides and also over the dorsum except a light colored band on each side from anterior end back to spinnerets and a light spot in middle; dorsum clothed with iridescent scales.

Chelicerae very oblique, anterior face flattened, a fringe of white hair along outer side; claw slender, curved toward base and toward tip, the intervening portion nearly straight. Palpus as shown in fig. 120.

Length, 3.9 mm.; cephalothorax, 1.8 mm.

Type: Male, No. 1460, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 12, 1921, at Guaymas, Sonora.

140. *Phidippus arizonensis* Peckham

Attus arizonensis Peckham, New or little known Attidæ, 1883, p. 13.

Phidippus arizonensis Peckham, Trans. Wisc. Acad. Sci., 1888, VII, p. 18.

Phidippus tuberculatus F. Cambridge, Biol. Centr. Arach., 1901, II, p. 283.

Localities: Ensenada, April 7, one; San Nicolas Bay, May 16, one; Guaymas, April 9, one; San Pedro Bay, July 7; San Pedro Nolasco Island, April 17; San Esteban Island, April 19, three; Carmen Island, May 21, one female, E. P. Van Duzee; Espiritu Santo Island, June 1, one; Tiburon Island, July 5, one.

Previously known from Texas, Arizona, California, and from several points in Mexico.

141. *Phidippus formosus* Peckham

Attus formosus Peckham. New or little known Attidæ, 1883, p. 23.

Phidippus formosus Peckham, Trans. Wisc. Acad. Sci., 1909, XVI, p. 407, pl. 31, fig. 2.

Locality: Ensenada, April 7, one specimen.

142. *Phidippus johnsonii* Peckham

Attus johnsonii Peckham. New or little known Attidæ, 1883, p. 22, fig. 17.

Phidippus johnsonii Peckham, Trans. Wisc. Acad. Sci., 1888, VII, p. 20, pl. 1, fig. 14, pl. 14, fig. 14.

Locality: Nogales, Arizona, April 4, two females, E. P. Van Duzee.

143. *Phidippus tyrelli* Peckham

Trans. Wisc. Acad. Sci., 1901, XIII, p. 296, pl. 24, fig. 4.

Phidippus montivagus Peckham, *ibid.*, p. 293, pl. 24, fig. 3.

Phidippus albulatus F. Cambridge, Biol. Centr. Amer. Arach., 1901, II, p. 285, pl. 27, fig. 9.

Locality: Pond Island, June 30, one.

Previously recorded from Canada and the Rocky Mountain States and from Mexico.

144. *Dendryphantes imperialis* Peckham

Attus imperialis Peckham, Trans. Wisc. Acad., 1888, VII, p. 44, pl. 3, fig. 31.

Dendryphantes manni Peckham, *ibid.*, 1900, XIII, p. 326, pl. 28, fig. 1.

Dendryphantes imperialis Peckham, *ibid.*, 1909, XVI, p. 459, pl. 37, fig. 2.

Localities: La Paz., April 11, 1919, one immature; San Luis Gonzaga Bay, April 29, two; San Francisquito Bay, May 10, eight young; Salinas Bay, Car-

men Island, June 17, one adult male; Concepcion Bay, June 18, one male; Marquer Bay, Carmen Island, May 23, one; Espiritu Santo Island, June 1, one; Ceralbo Island, June 7, one; San José Island, June 10, one; Puerto Refugio, Angel de la Guarda Island, June 29, many.

It seems obvious that this species, previously recorded only from Arizona and California, is a very common form in Lower California and on the islands of the Gulf. Most males in the present collection have the clypeus wholly white.

145. *Dendryphantes limbatus* Banks

Philaeus limbatus Banks, Proc. Cal. Acad. Sci., 1898, Ser. 3, I, p. 282, pl. 17, fig. 17.

Philaeus consimilis Banks, *ibid.*, p. 283, pl. 17, fig. 13.

Dendryphantes limbatus Peckham, Trans. Wisc. Acad. Sci., 1900, XIII, p. 315.

Localities: Puerto Ballandra, Carmen Island, May 21, one male taken by E. P. Van Duzee; Espiritu Santo Island, June 1, one male.

Previously reported from Mexico and Texas.

146. *Dendryphantes carmenensis* Chamberlin, new species

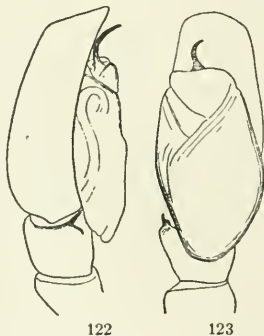


Fig. 122. *Dendryphantes carmenensis*, right male palpus, ectal view.

Fig. 123. Same, ventral view.

Male: Cephalothorax with lower part of sides dark, the upper part clothed with white hair forming a band beneath eyes and extending caudad upon posterior declivity; clypeus fringed with white hair below; anterior face of chelicerae clothed with white hair and scales above. Legs yellow, strongly annulate with black; femora of first legs almost wholly black except a light spot at distal end above, the femora of the other legs with a broad black

annulus nearer distal than proximal end; patellæ with annulus at distal end; tibiæ with annulus at both ends but that at proximal end narrow; metatarsi and tarsi not annulate. Dorsum of abdomen chocolate colored, the dark area enclosing paired light spots which are more line-like on posterior portion; a band of white hair across anterior face and along each side adjacent to the dark dorsal area; the lower part of sides dark; venter pale. The coloration in general nearly as in *æneolus* and other members of the *capitatus* group.

Chelicerae vertical. Ventral spines of tibia I 3-3, evenly paired, the first pair being but little proximad of middle. Ventral spines of tibia II 3-1, the single spine under posterior border at distal end; one spine on upper part of anterior side of this joint. Palpus, fig. 122 and 123.

Length, 4.5 mm. Cephalothorax, 2 mm.

Type: Male, No. 1461, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 16, 1921, at Salinas Bay, **Carmen Island, Gulf of California.**

In general appearance suggesting *imperialis* (Peckham) and nearly related species but readily distinguished in having a curved embolus of the *militaris* type in the male palpus. It differs also, e. g., in the ventral spines of tibia I, these in *imperialis* not being so nearly evenly paired, the first spine under the posterior border being obviously farther proximad than in *carmenensis*.

147. *Dendryphantes chera* Chamberlin, new species



124

Fig. 124. *Dendryphantes chera*, epigynum.

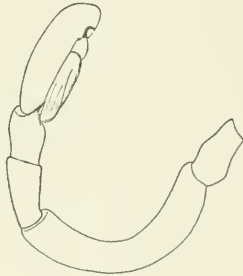
Female: Under alcohol the integument is chestnut or darker, typically blackish about the eyes or over the dorsal area of the head; it is clothed with nearly white hair, with longer black bristles near the eyes; clypeus clothed with white hair; chelicerae with white scales at base. Legs yellow, with annuli absent or obsolete. Sternum yellowish, dusky about the periphery. Abdomen under alcohol pale throughout, yellow or yellowish white, or a little dusky above; without markings or with a dark patch across anterior end; the types rubbed so that character of hair cannot be ascertained, but it appears to have been in part yellow on the dorsum.

Spines of tibia I beneath 3-3, evenly paired; spines of tibia II beneath 1-3, the three under the posterior border being in series, with the distal one paired with the one under the anterior border. Epigynum, fig. 124.

Length, 4.5 mm. Cephalothorax, 1.72 mm.

Type: Female, No. 1462, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 10, 1921, on **San Josef Island, Gulf of California**. *Paratypes:* Mus. Calif. Acad. Sci. and M. C. Z.; San Diego Island, June 11, one female; Tortuga Island, June 22, one female, E. P. Van Duzee; San Francisco Bay, June 23, one female.

148. *Dendryphantès melanomerus* Chamberlin, new species



125



126

Fig. 125. *Dendryphantès melanomerus*, right palpus of male, ectal view.

Fig. 126. Same, ventral view.

Male: Carapace dark; head black, clothed above with iridescent scales, the lower border clothed with white scales, white band narrowing and running out cephalad. Femora of all legs dark, blackish, the patellæ, tibiæ and metatarsi usually also in some degree darkened, the dark areas being longitudinal, never annuliform. Abdomen dark below and over sides, the dorsum somewhat lighter and clothed with iridescent scales; a rather narrow light stripe across anterior end and extending back on each side toward middle; on posterior half a vertical white stripe up each side and reaching a little way on dorsum.

Chelicerae oblique, moderately long; the fang long, constricted near base, and then of nearly uniform diameter to the attenuated distal portion. Spines under tibia I 3-3, all short, the three anterior ones stouter and closer together;

spines under tibia II 1-3, the three being under the posterior border. The palpus as shown in figs. 125 and 126. The form of the embolus is particularly characteristic. Length, 4 mm.; cephalothorax, 2.1 mm.

Type: Male, No. 1463, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 18, 1921, at **Coyote Bay, Concepcion Bay, Lower California**. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z. (male and immature female); same data, numerous specimens, chiefly from bushes, especially of *Calaphanes* and *Maytenus*.

149. *Dendryphantes zygoballoides* Chamberlin, new species

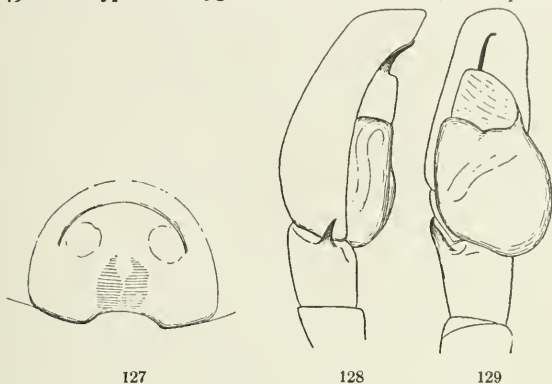


Fig. 127. *Dendryphantes zygoballoides*, epigynum.

Fig. 128. Right palpus of male, ectal view.

Fig. 129. Same, ventral view.

Male: Cephalothorax dark, clothed with iridescent scales, with a broad band of white hairs on each side, continuous across clypeus, and a transverse oblong band of white hairs on head between first and third eye-rows; anterior face of chelicerae clothed above with white hairs and scales. Integument of femora of anterior legs dark, the patella with a dark annulus at distal end, the tibia with one at each end, and the metatarsus and tarsus dark at distal end. The posterior femora lighter, the other joints darkened at ends as on the anterior legs; clothed with white scales and below with sparse white hairs, the other hairs or bristles dark. Abdomen with dorsal region dark, chocolate colored, clothed with iridescent scales; a broad band of white hair over anterior face and along each side and extending into the dorsal dark area as two notches on each side; venter dark.

Pars cephalica high, with posterior eye-row obviously widest, the general appearance *Zygoballus*-like. Chelicerae oblique. First legs long; tibia I bear-

ing beneath three pairs of spines; metatarsus I with two pairs of ventral spines of which one pair is at distal end and the other at middle of joint; tibia II with three pairs of spines beneath, a pair at distal end, and a single spine farther back under posterior border. Palpus, figs. 128 and 129.

Length, 5 mm.; cephalothorax, 2.5 mm.

Female: Coloration as in the male excepting that the femora of the anterior legs are not darkened. Epigynum, fig. 127. Length, 5 mm.; cephalothorax, 2.5 mm.

Type: Male, No. 1464, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 3, 1921, at Palm Cañon, Angel de la Guarda Island, Gulf of California. *Allotype*, female, No. 1465, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 12, 1921, on San Marcos Island. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z.; San Carlos Bay, July 8; Willard's Point Bay, Tiburon Island, July 3; San Marcos Island, May 12; San Lorenzo Island, May 9; Coronados Island, May 18, E. P. Van Duzee.

150. *Dendryphantes diplacis* Chamberlin, new species

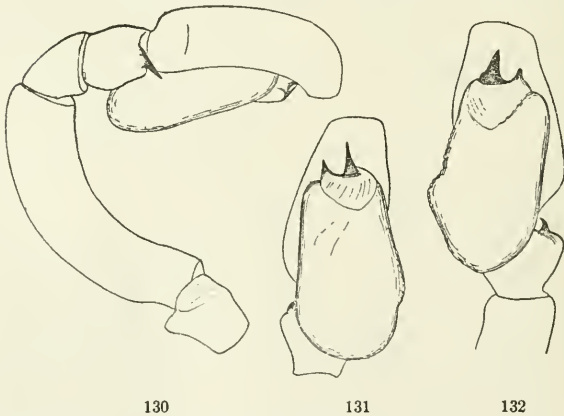


Fig. 130. *Dendryphantes diplacis*, right palpus of male, ectal view (San Diego Island).

Fig. 131. Tarsus of same, ventral view.

Fig. 132. Left palpus, ventral view of a variant specimen from Nogales, Arizona.

Male: General appearance that of *cafitatus*. Sides and posterior declivity of carapace clothed with white hair; the dorsum of head in the type rubbed; legs with femora dark, the patellæ and tibiæ with a dark annulus at each end and the metatarsus with an annulus at distal end; abdomen with a white band around anterior end and along sides of dorsum, a dark longitudinal band mesad of it on each side more or less broken into dark spots, the middorsal region unmarked.

Chelicerae moderately large, oblique, the teeth of margins long.

Readily differentiated from other North American species in the details of the palpus, particularly in the presence of a well-developed chitinous process ectad of the base of the embolus (figs. 130 to 132).

Length, 5 mm.; cephalothorax, 2.8 mm.

Type: Male, No. 1049, M. C. Z., collected near **San Diego, California**. *Paratypes*: Mus. Calif. Acad. Sci. and M. C. Z.; Nogales, Arizona, April 4, 1921, E. P. Van Duzee.

151. *Sassacus vanduzeei* Chamberlin, new species



133

Fig. 133. *Sassacus vanduzeei*, epigynum.

Female: Carapace black, clothed with white hair, though the rubbed condition leaves the character of the hair of the ocular region in doubt; legs yellowish, the first femora black, the others more or less dusky over the yellow ground; abdomen dark; a band of white hair around anterior end and a short distance caudad on each side, the white hair elsewhere scattered; iridescent scales present on dorsum.

Tibia I with three ventral spines, two in series under anterior border at distal end and one under posterior border paired with the proximal anterior one; tibia II also with three spines beneath, two in series under posterior border and one under anterior border at distal end. Cephalothorax high, with the anterior part of thoracic division on a level with the head; posterior declivity abrupt and steep. Epigynum, fig. 133.

Length, 4.8 mm.; cephalothorax, 2.1 mm.

Type: Female, No. 1466, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, April 18, 1921, on **San Pedro Martir Island, Gulf of California.**

152. *Pellenes delectus* Peckham

Trans. Wisc. Acad. Sci., 1909, XVI, p. 550, pl. 47, fig. 6; pl. 49, fig. 1.

Locality: Mulegé, May 14, one male and one female taken by E. P. Van Duzee.

This species was previously known from Texas.

153. *Pellenes divaricatus* (Banks)

Habrocestum divaricatum Banks, Proc. Cal. Acad. Sci., 1898, Ser. 3, I, p. 287, pl. 17, fig. 7.

Pellenes divaricatus Peckham Bull. Wisc. Nat. Hist. Soc., 1900, I, p. 196, 203.

Localities: Monserrate Island, June 13, one female; Santa Inez Island, May 13, one female taken by J. C. Chamberlin and one by E. P. Van Duzee on same date.

Previously known from Sierra San Lazaro, Lower California.

154. *Pellenes dolosus* Peckham

Bull. Wisc. Nat. Hist. Soc., 1900, I, p. 225, pl. 1, fig. 20.

Localities: South San Lorenzo Island, June 24, one female; Ensenada, April 7, two females; San Francisquito Bay, May 10, one female.

Previously known from Arizona and southern California.

155. *Pellenes elegans* Peckham

Bull. Wisc. Nat. Hist. Soc., 1900, I, p. 212, pl. 1, fig. 3; Trans. Wisc. Acad. Sci., 1909, XVI, p. 552, pl. 44, fig. 9; pl. 46, fig. 4.

Pellenes birgei Peckham, Bull. Wisc. Nat. Hist. Soc., 1900, I, p. 217, pl. 1, fig. 8.

Localities: San Francisquito Bay, May 10, one male; Agua Verde Bay, May 21, one immature male; Concepcion Bay, June 18, two males; Angeles Bay, June 27, one male, E. P. Van Duzee; San Marcos Island, June 11, five specimens taken by J. C. Chamberlin, and June 19, one by E. P. Van Duzee; San Francisco Island, June 30, two specimens taken by E. P. Van Duzee and six by J. C. Chamberlin; Tortuga Island, June 22, two specimens taken by E. P. Van Duzee, and May 11, one taken by J. C. Chamberlin; Puerto Refugio, Angel de la Guarda Island, June 29, one male.

This conspicuously marked species seems to be the commonest and most widespread species of the genus upon the islands of the Gulf of California. It occurs also in the South-western United States, having been recorded from Kansas, New Mexico, Colorado, Utah, Arizona and California.

156. *Pellenes hirsutus* Peckham

Habrocestum hirsutum Peckham, Trans. Wisc. Acad. Sci., 1888, VII, p. 64, pl. 4, fig. 47.

Pellenes hirsutus Peckham, Bull. Wisc. Nat. Hist. Soc., 1900, I, p. 211.

Localities: Nogales, Arizona, April 4, three, E. P. Van Duzee; Isla Partida, April 22, two males, one by E. P. Van Duzee and one by J. C. Chamberlin.

This western species was previously recorded from Colorado, New Mexico, Utah, California and Oregon. The male from Isla Partida has the bright red clypeus occasionally present in this form.

157. *Pellenes tranquillus* Peckham

Bull. Wisc. Nat. Hist. Soc., 1900, I, p. 213, pl. 1, fig. 4.

Locality: Pond Island, July 1, one male.

Previously known only from Arizona.

158. *Pellenes ammophilus* Chamberlin, new species



134

135

Fig. 134. *Pellenes ammophilus*, right palp of male, ectal view.

Fig. 135. Same, ventral view.

Male: Integument of carapace black, clothed with grey hair; clypeus white in middle and on each side in a band running from outer side of anterior median eye obliquely outward and downwards and then along margin caudad; integument of legs blackish excepting on tarsi. Abdomen blackish, with several oblique light lines on each side; the hair now mostly rubbed off but apparently mostly grey on dorsum. Tarsus of palpus clothed with white hairs above. First legs with a thick fringe of greyish hair beneath femur, a sparse fringe also below patella and metatarsus; femur of third leg with a swelling at distal end on anterior side, this bearing above a short stout spine and many short setae; above this swelling a second group of short setae; patella of third leg flattened on anterior side, a ridge along anterodorsal surface. Tibia I with three pairs of spines beneath, those of the anterior border long and conspicuous, projecting anterodistally; also a single spine above these on anterior surface. Palpus, figs. 134 and 135. Length, 5.5 mm.; cephalothorax, 3 mm.

Type: Male, No. 1467, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 7, 1921, on Ceralbo Island, Gulf of California. "Found running on sand along a spit; very agile and hard to catch, jumping from two to eight inches at a bound;" *Paratype*: Male, No. 1061, M. C. Z., collected by E. P. Van Duzee, May 29, 1921, on San Francisco Island.

159. *Pellenes anepsius* Chamberlin, new species



136

Fig. 136. *Pellenes anepsius*, epigynum.

Female: Carapace and abdomen above densely clothed with brown hairs, with no markings; clypeus white in the middle; legs brown, without markings; venter of abdomen pale, clothed with grey hair.

Tibia I with 3-3 spines beneath, none on anterior surface; tibia II with four ventral spines, a pair at distal end and two in series behind these under caudal border. Epigynum, fig. 136. Length, 5.2 mm.; cephalothorax, 3 mm.

Type: Female, No. 1468, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, May 14, 1921, under bark of an Acacia on bank of a reservoir at **Mulegé, Lower California.**

160. *Pellenes angelus* Chamberlin, new species



137

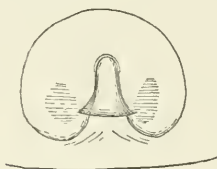
Fig. 137. *Pellenes angelus*, epigynum.

Female: Carapace dark, clothed throughout with grey hair. Clypeus clothed densely with white hair; sternum black. Legs yellowish, the femora darkened on sides at distal end; patellæ and tibiæ tending to be darker at ends, and the metatarsi may be darker at distal end. Abdomen pale beneath; dorsum with a median longitudinal dark stripe which in posterior part has its sides serrate, herring-bone-like; the sides of dorsum with dark areas, densely clothed with grey hair.

Tibia I with four spines beneath, a pair near middle, a single spine on caudal side toward base, and a small one under anterior border at distal end; no spine on anterior surface; tibia II below with three spines, a single small one at distal end on anterior side and two in series under posterior border, one of these at middle and one toward base; a spine on anterior surface above. Epigynum, fig. 137. Length, 4 mm.; cephalothorax, 2.1 mm.

Type: Female, No. 1469, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 29, 1921, at **Puerto Refugio, Angel de la Guarda Island, Gulf of California.** *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z.; same place as type, May 1, beaten from bushes; San Esteban Island, April 20, 1921.

Specimens from San Esteban Island show slight color differences.

161. *Pellenes corticolens* Chamberlin, new species

138

Fig. 138. *Pellenes corticolens*, epigynum.

Female: Integument of carapace black, clothed throughout with grey hair, with no distinct bands or markings. Clypeus clothed with white hair; sternum black, with long white hairs; chelicerae black; integument of legs fulvous, annulate with black; clothed with grey hair which in life masks the annuli; abdomen also nearly uniformly clothed above and on sides with grey hair, that of the venter brighter.

Tibia I with three pairs of spines beneath; tibia II with four spines beneath, three under posterior border and one at distal end under anterior border; none on anterior face. Epigynum, fig. 138. Length, 5 mm.; cephalothorax, 2.5 mm.

Type: Female, No. 1470, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, April 29, 1921, at San Luis Gonzaga Bay, Lower California.

In general coloration similar to *P. polius* new species, but it is a smaller species differing in form of epigynum and in the spining of the legs.

162. *Pellenes polius* Chamberlin, new species

139

Fig. 139. *Pellenes polius*, epigynum.

Female: Integument of cephalothorax and abdomen dark, clothed with grey hair and wholly without definite bands or other markings, the venter somewhat brighter colored than the dorsum; legs light, clothed with grey or whitish hairs like those of body; clypeus densely clothed with bright white hair, the marginal ones long; long white hair on chelicerae.

Tibia I with three pairs of spines beneath; tibia II with five spines beneath, three under posterior border and two under anterior border paired with the median and distal ones of posterior series; a spine on anterior face.

Epigynum, fig. 139. Length, 7.2 mm.; cephalothorax, 3.8 mm.

Type: Female, No. 1471, Mus. Calif. Acad. Sci., collected by J. C. Chamberlin, June 12, 1921, on **Santa Catalina Island, Gulf of California.**

The single specimen was taken "on the rocks at beach a foot or so above the water. When captured it was feeding on a small fly."

This species in structure resembles *P. pyrrihrix* but is at once distinguishable in lacking the reddish or copper-colored hair on the abdomen.

163. *Pellenes pyrrihrix* Chamberlin, new species



140

Fig. 140. *Pellenes pyrrihrix*, epigynum.

Female: Integument of carapace black, clothed above with somewhat iridescent scales of a greyish brown cast; white hairs in a band along lower part of sides and across clypeus, some white scales also on upper part of anterior face of chelicerae; dorsum of abdomen clothed with red hair, white hair over anterior surface, sides and venter; legs brown, clothed with sparse white scales and dark hairs.

Ventral spines of tibia I three pairs; none on anterior surface; tibia II with a pair of ventral spines at distal end, two in series behind the posterior of these two; a spine on anterior face above. Epigynum, fig. 140.

Length, 8 mm.; cephalothorax, 4 mm.

Type: Female, No. 1472, Mus. Calif. Acad. Sci., collected by E. P. Van Duzee, July 7, 1921, at **San Pedro Bay, Sonora**, swept from palo verde. *Paratypes* in Mus. Calif. Acad. Sci. and M. C. Z.; San Carlos Bay, July 8, 1921, E. P. Van Duzee.

PROCEEDINGS
OF THE
CALIFORNIA ACADEMY OF SCIENCES
FOURTH SERIES

VOL. XII, No. 29, pp. 695-949, pls. 12-88, map. MAY 13, 1924

XXIX
EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921*

THE MARINE ALGÆ

BY
WILLIAM ALBERT SETCHELL
and
NATHANIEL LYON GARDNER

INTRODUCTION

Very little is known about the marine algæ of the western coast of North America south of the boundary of the United States. These coast lines, viz., of Mexico, Guatemala, Salvador, Nicaragua, Costa Rica and Panama, extend from somewhat above 32° lat. N. down to about 5° lat. N., or about twenty-seven degrees of latitude, while east and west, they extend from 77° long. W. to 118° long. W., or almost forty-one degrees of longitude. Altogether these west coasts of Mexico and the Central American states form a considerable proportion of the coast line of Pacific North America. From this extensive coast line there are at present fewer than sixty

*A general account of the expedition accompanied by a map showing all of the islands, etc., visited by the expedition is to be found in vol. XII, No. 6, of the Proceedings of the California Academy of Sciences for June 2, 1923.

A reprint of the map showing all of the islands, etc., visited by the expedition next to back cover of this paper.

May 13, 1924

species of marine algæ listed and where we might expect at least several hundred to occur.

Of the coast line of western North America south of the United States, the shores of the Gulf of California represent something more than a thousand miles and somewhere about forty species are listed from them (cf. Hariot, 1895 and M. A. Howe, 1911). From the Mexican coast, southward from the mouth of the Gulf of California, Liebmann, of Copenhagen, collected twelve species of marine algæ (cf. J. G. Agardh, 1847). M. A. Howe (1910) has remarked on the scantiness of the marine flora of the Bay of Panama where he found about fifty inconspicuous, mostly incrusting species and of which, as yet, he has not published any determinations. Of the islands off the coast, a few specimens have been collected on Guadalupe Island by Palmer and Brandegee, of which two species of Sargassaceæ have been described as new (cf. Grunow, 1915, p. 338, Gardner, 1913, p. 325, 1917, p. 386, and 1918, p. 448).

It is with the greatest interest, therefore, that we have undertaken the study of the comparatively large collection made by Mr. Ivan M. Johnston on the expedition of the California Academy of Sciences to the Gulf of California in the summer of 1921. In our study we have also included two other fairly extensive collections from the same region, viz.: one made in 1890 by T. S. Brandegee and Walter E. Bryant on the third expedition sent out by the California Academy of Sciences to explore Lower California, particularly the Cape region, and a collection made by Dr. and Mrs. Marchant in 1917. Among the specimens of these collections, we have detected one hundred and forty-four species and varieties, of which one hundred and eleven are, in our judgment, new to science. The Corallinaceæ and less conspicuous epiphytic forms remain for future study. These results are in line with the experience of Hariot and of Howe, each of whom, however, dealt with much smaller collections. Hariot (1895) describes three new species and lists four as referable to described species. Howe (1911), working over collections made chiefly at La Paz by G. J. Vives, and at San Felipe Bay (about five hundred miles north of La Paz) by D. T. MacDougal, describes seven new species, lists sixteen species as referable to described species,

and notes four species not to be determined beyond the genus. In these two lists of species there is no duplication. Howe, in his list, reports on a few species found in the herbarium of Dr. C. L. Anderson (of Santa Cruz, California) whose collectors were unknown to him. These were undoubtedly collected by the first or second expedition of the California Academy of Sciences and previous to 1890. It seems likely that there will be found to be an exceedingly rich marine flora in the Gulf of California when it shall have been carefully and thoroughly explored.

The subtropical flora of the southern California coast extends down to Magdalena Bay, or possibly somewhat to the south of it, but at San José del Cabo, the water is evidently warm enough (25° C. or over) to be considered tropical and this condition extends up the Gulf. The winter marine flora may be subtropical, however, at least in portions of the Gulf of California. The more exact relations of the algal flora to temperature and to salinity, as well as to substratum cannot be entered into with any certainty at present, since full data are not yet available.

The affinities of the marine flora of the Gulf of California are with that of the Eastern Pacific, i. e., with the subtropical and tropical coasts of Western America, which we know chiefly through Howe's Marine Algæ of Peru (1914) and our own publications (incomplete) for the western coast of North America. There is a wealth of species of *Codium*, of *Sargassum*, of *Laurencia*, of *Grateloupia*, of *Gracilaria* and of *Ceramium*. There is a noticeable, and we may infer, significant lack of species of *Halimeda* and other calcareous Siphonales, of species of *Liagora*, *Galaxaura* and calcareous reds, but the Corallinaceæ of our collections are not, as yet, identified.

We desire to express our indebtedness to Mr. T. S. Brandegee, to Dr. and Mrs. Marchant and to Mr. Ivan M. Johnston for collections of marine algæ, undertaken at request and in addition to other duties, and to Dr. Anna Weber-van Bosse and to Dr. Marshall A. Howe for critical notes. To the California Academy of Sciences, and, in particular, to Dr. Barton W. Evermann and to Miss Alice Eastwood, we are indebted for the privilege of carrying through these studies.

MYXOPHYCEÆ

Family CHROOCOCCACEÆ

CHLOROGLOEA WILLE, Algol. Not. I-VI, 1900, p. 5

Chlorogloea regularis S. and G. sp. nov.

Plate 12, fig. 1

Plants forming cushions very definitely circular in outline, up to 200 μ in diameter and 30 μ thick in the center; cells in the basal layer spherical to subspherical in the center of the thallus, cylindrical at the ends of the radiating rows, 0.5-1 μ diam., marginal cells 2 times as long as broad; cells in the vertical rows spherical; the radiating basal filaments dichotomously branched; color pale blue-green.

Growing in abundance on *Cladophoropsis robusta*.

Type: No. 1316, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 135a), at **Tortuga Island, Gulf of California.**

In its method of development this species of *Chlorogloea* resembles the genus *Radaisia*. The colony or plant starts as a single cell, which divides a number of times in different vertical planes, soon establishing a number of growing points around the margin of a circular plate. From this margin radiating rows of cells, or that which amounts to filaments, develop, which by dichotomous branching build up a solid basal layer. The largest plant noticed measured 200 μ in diameter. The cells in the center of the basal disk soon begin to divide in horizontal planes and contiguous rows of cells up to 30 μ long are generated. In the genus *Radaisia* the terminal cells of these vertical rows of cells, or filaments, produce gonidia. The gonidia formation is absent in *Chlorogloea*.

Family CHAMÆSIPHONACEÆ

DERMOCARPA CROUAN, Notes sur Quelques Algues Marines Nouvelles, 1858, p. 70

Dermocarpa fucicola Saunders

A few colonies of a *Dermocarpa* which seem to be of this species have been observed intermixed with other species of Myxophyceæ as epiphytes on other algæ, notably upon *Graci-*

laria pachyderma. The general form and size correspond very well with the description and figures given by Saunders (1901, p. 397, pl. 46, figs. 4, 5). The plants do not form as large colonies as in typical material found along the coast of Washington and California. The length of the cells varies from 50 μ to 60 μ . We place it here pending further investigation of more typical material.

Dermocarpa Reinschii S. and G. sp. nov.

Plate 12, fig. 6

Cells epiphytic, narrowly to broadly pyriform, 18-24 μ long, 15-20 μ wide at the top, few to many forming colonies circular to irregular in outline; color steel blue; contents homogeneous; gonidia formed simultaneously, 1.5 μ diam.

Growing on various species of red algæ.

Type: No. 1317, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 34c), in June, at **Tortuga Island, Gulf of California**.

Dermocarpa Reinschii approximates very closely to *D. prasina* (Reinsch) Born. & Thur. The shape and size of the colonies do not agree entirely with the description and figures given by Bornet and Thuret (cf. Notes Algol., p. 76, pl. 26, figs. 6-9). This is particularly true of the shapes of the gonidangia and the arrangement of the gonidia. We have examined the material of Howe's *D. prasina* growing on *Chatomorpha cartilaginea* from Peru (Howe, Mar. Alg. Peru, p. 16). The colonies of this material are thicker and more extensive and there is a much greater polymorphism in the shapes of the cells. The cells in his material are very commonly "trumpet shaped." Ours do not show such variations. The type of *Sphænosiphon prasinus* Reinsch (Contrib. Alg. et Fung., p. 17, pl. 26, fig. 1) is probably not available and since the interpretations of Reinsch's conception of the species have been so varied and our plant differs so decidedly in dimension from all of them, we hardly feel justified in adopting the name of *D. prasina* for our material from the Gulf of California.

Dermocarpa Marchantæ S. and G. sp. nov.

Plate 12, fig. 12

Cells aggregated into relatively extensive colonies, at times several hundred, densely crowded, cuneate to balloon-shaped, 18-22 μ long, 9-12 μ broad at outer end; gonidia few, 2-2.5 μ in diam.

Growing on various species of algæ. Santa Rosalia, Lower California, opposite Guaymas. Type, Marchant, no. 108, May.

Only a very few specimens of this species of *Dermocarpa* have been observed producing gonidia. The gonidangia of these are no longer than the other larger cells. It is presumed that they are just coming into fruit. Little can be said of the method of formation of the gonidia on account of scarcity of material.

Dermocarpa sp.

Plate 12, fig. 11

There is a species of *Dermocarpa* which seems to be widely distributed along western Mexican borders. It is very generally present on various species of Dictyotaceæ in particular, as well as on a variety of other algæ. Figure 11 represents specimens growing on *Dictyota* sp. (Johnston, no. 5a). The rather uniformly cylindrical character of the cells and their wide expansion in a continuous stratum indicate that it is distinct from any known species, but since no specimens out of the many which we have observed have been found producing gonidia, we feel that it is too immature for us to attempt to diagnose and name it. The cells in the present state are 12-15 μ long. The only described species to which it at all approximates is *D. strangulata* Sauv. (1895, p. 8 (Repr.), pl. 7, fig. 4), which quite likely also represents an immature species. It is possibly only a young state of *D. Marchantæ*.

XENOCOCCUS THURET, Essai Class. Nost., 1875, p. 373 (*Nom. nud.*);
Bornet and Thuret, Notes Alg. 2, 1880, p. 73 (descr. of type).

***Xenococcus deformans* S. and G. sp. nov.**

Plate 12, fig. 2 and plate 40, fig. a

Plants embedded in the cuticle of the host, 75-150 in a colony, dividing in two planes only; cells spherical to slightly pyriform, 10-14 μ long, 9-12 μ broad; contents homogeneous; color bright blue-green.

Growing in *Gelidium Johnstonii*.

Type: No. 1318, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 13a), in June, at **San Francisquito Bay, Lower California.**

This species of Myxophyceæ is the only representative of the genus *Xenococcus* which has been reported growing endophytically. Our attention was called to it by the peculiar effect it produces on the host. It was noticed that many specimens of the *Gelidium* had branches densely proliferating near or at their outer ends (Plate 40, fig. a). These short, densely crowded outgrowths proved to be infested by this species of Myxophyceæ. No gonidangia are present in our material, hence the generic position will have to stand in doubt for the present. Some of the cells are much larger than others, indicating preparation for gonidia formation. Its division in two planes only, excludes all other Chamæsiphonaceæ. It does not resemble very closely any of the known Coccogonales.

Family OSCILLATORIACEÆ

HYDROCOLEUM KUETZING, Phyc. Gen., 1843, p. 196.

***Hydrocoleum codicola* S. and G. sp. nov.**

Plate 12, fig. 3

Filaments associated more or less into loose rope-like colonies interwoven among the utricles of the host; sheath very delicate and hyaline, containing few to many trichomes; trichomes cylindrical or at times slightly tapering at the

apices, pale blue-green, 2.75-3.25 μ diam.; cells not constricted at the dissepinments, 0.5-1.5 times as long as the diameter, the terminal cells somewhat enlarged and rounded with decidedly thickened end walls.

Penetrating among the utricles of *Codium* sp. in the upper sublittoral belt.

Type: No. 1319, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 8a), in June, at **San Marcos Island, Gulf of California.**

The habitat of this species of *Hydrocoleum* is decidedly unusual and the trichomes are the narrowest yet described for the genus. The genus typically has few and relatively large trichomes. It is difficult to distinguish the largest colonies from certain species of *Phormidium* but the smaller colonies are definitely bound together in a single sheath. The trichomes, however, are not densely intertwined like those of *Microcoleus*. It seems generally prevalent on various species of smaller *Codiums* in the Gulf.

Family RIVULARIACEÆ

CALOTHRIX AGARDH, Syst. Alg., 1824, p. XXIV

Calothrix nodulosa S. and G. sp. nov.

Plate 12, figs. 9, 10

Plants gregarious, loosely associated into small, stellate fascicles, 350-450 μ high; filaments decumbent at the base, the free end soon becoming erect, 28-32 μ diam., subcylindrical, tapering rather abruptly at the apices to blunt ends, not distinctly bulbous at the bases; sheath 3-4.5 μ diam., hyaline, homogeneous, closed for some time but later dissolving at the apex, becoming funnel-shaped above the middle where the trichome becomes constricted, eventually dies and the end breaks through to form a false branch; trichome aeruginous, 20-24 μ diam., very blunt at the apex, not terminating in a hair, cells 2-2.5 μ long, protoplast homogeneous, cross walls very inconspicuous; heterocysts 1-4, basal, variously shaped.

Forming microscopic fascicles on various species of *Laurencia*.

Type: No. 1320, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 9e), in June at **San Marcos Island, Gulf of California**.

This species appears to be most closely related to *C. consociata* (Kütz.) Bornet et Flah., in habit and size, of all the described species, but differs in several minor details, particularly in not having the trichomes so long-attenuated and in the character of the sheath, which is much thinner, hyaline, and very delicately striate.

A pronounced character of the species is the constriction of the trichome in advance of the formation of intercalary heterocysts and the resulting hormogonia and false branching. This constricted appearance seems to be formed by the re-establishment of rapid growth at the attenuated apex of the trichome suddenly enlarging it at that point while the attenuated portion remains unchanged and finally dies, separating the trichome at that place. This character is not well shown in the illustration, plate 12, fig. 10.

***Calothrix nidulans* S. and G. sp. nov.**

Plate 12, fig. 7

Plants epiphytic or slightly embedded in the gelatinous covering of the host, procumbent, 40-60 μ long, 10-12 μ diam. at the very much swollen base, much diminished above, not branched; sheath very delicate, hyaline and homogeneous; trichome dull æruginous, 9-11 μ diam. at the enlarged base, constricted at the dissepiments below, cross walls inconspicuous above; heterocysts basal, single, considerably flattened.

Growing on a fragment of a young filamentous brown alga, possibly *Liebmannia*. Locality not noted.

Type: No. 1321, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 162), locality not noted.

This species is very close to *Calothrix parasitica* (Chauv.) Thuret, but differs in being much smaller in all of its dimensions and in not having hairs. The base is very decidedly bulbous and the three or four basal cells are very prominent and constricted at the dissepiments.

CHLOROPHYCEÆ

Family CAULERPACEÆ

CAULERPA LAMOUROUX, Mem. Caulerpes, 1809, p. 141*Caulerpa Vanbosseæ* S. and G. sp. nov.

Plate 13, figs. 13-15

Plants forming dense pulvinate masses 1.5-2 cm. thick, attached by delicate branched hyaline rhizoids; erect fronds irregularly and alternately (occasionally opposite) branched, more or less irregular, cylindrical; terminal ramuli slightly clavate; main fronds and ramuli 400-500 μ diam.; trabeculæ of numerous, delicate, much branched, cylindrical threads intertwined in the center of the filament; reproduction unknown.

Habitat unknown. Vicinity of La Paz. Type, Bryant, no. 1.

The plants on which we base our diagnosis seem most closely related to *Caulerpa fastigiata* Mont., both as regards habit and general structure, but they show, when boiled with potash solution, small papilliform projections from the inner surface of the walls. According to Correns (1894), who discovered such structures among the species of *Caulerpa*, these are wanting in *C. fastigiata* Mont. Through the kindness of Dr. Anna Weber-van Bosse, we have been able to study specimens of *C. fastigiata* sent by Montagne to Kuetzing. These cotypes show low but distinct papillæ and simple trabeculæ as well as more slender (180-220 μ) and less rigid filaments than *C. Vanbosseæ*. Our species, therefore, belongs to the section of Vaucherioideæ and is closely related to, but distinct from, *C. fastigiata* Mont.

Family CODIACEÆ

HALIMEDA LAMOUROUX, Class. Polypes, 1812, p. 186*Halimeda discoidea* Decne.

Marchant, no. 7, and Bryant, no. 2, La Paz. This species is apparently rather limited in distribution. Howe (1911, p. 492) reported it collected by Vives in the same locality.

CODIUM STACKHOUSE, *Nereis Brit*, 1797, p. XVI

In treating the genus *Codium* in this account, we have felt compelled to propose several new species, at the same time feeling that the treatment must be more or less tentative on account of lack of adequate material for comparison and especially on account of the paucity of material and the lack of suitable field notes from the region covered. Observations on the effect of age and habitat upon the structure of the various parts of the plant, especially the size and thickening of the end walls of the utricles, is highly desirable. We have endeavored to give as complete an account in descriptions, photographs, and drawings as the material at hand will warrant, awaiting more abundant material and further investigation to completely establish the validity of the species here proposed.

***Codium tomentosum* (Huds.) Stackh.**

Plate 16, figs. 38, 39

In rendering our account of the Chlorophyceæ in the Marine Algæ of the Pacific Coast of North America (1920), we included *C. tomentosum* from La Paz, Mexico, rather on the authority of Howe (1911, p. 493), at the same time expressing some doubt as to the occurrence of typical material of this species within the range covered by our account. We are not now aware whether the type material of *C. tomentosum* is available to anyone, but during our present study we have examined the material of this species distributed by Le Jolis from Cherbourg in *Algues Marines de Cherbourg*, No. 204, of W. A. Setchell's copy. We are taking the view that this distribution, which was collected across the English Channel from the type locality of the species, viz., Exmouth in Devon, is likely to be as nearly typical as any which has yet been reported under this name. We have figured the utricles of this distribution in plate 16, figs. 38, 39, and with this material as the basis for our judgment we are still more convinced after a careful study of our material that it should not be included in the flora on the Pacific Coast of North America.

Otto C. Schmidt (1923), although excluding the West Indian forms still retains plants from many parts of the world under this species.

Codium simulans S. and G. sp. nov.

Plate 14, figs. 21, 22 and plate 31

Fronds up to 13 cm. high, 3-4 mm. diam., cylindrical, slightly flattened at the forkings and cuneate below; branching dichotomous throughout; utricles subcylindrical to clavate, 600-700 μ long, up to 200 μ diam. at the outer ends, which are rounded and somewhat flattened, never fornicate; terminal wall thickened, up to 50 μ thick, hairs 2 to several in a whorl, attached just below the thickened terminal wall; gametangia blunt, narrowly to broadly conical, tapering abruptly at the base, up to 250 μ long and 100 μ broad.

Growing on rocks in the upper sublittoral belt, San Marcos Island.

Type: No. 1322, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 8), in June, at **San Marcos Island, Gulf of California.**

Codium simulans approximates to *Codium tomentosum* more nearly than any of the other collections from the Gulf, as we interpret that species. The fronds of *C. simulans* are smaller, the dichotomies are slightly flattened and cuneate below, and the utricles have much thicker end walls than in *C. tomentosum*, and the hairs are at the uppermost portions of the lateral wall of the utricle. Howe's specimens of *C. tomentosum* are young, but seem to belong under *C. simulans* (cf. Howe, 1911, p. 493).

Codium conjunctum S. and G. sp. nov.

Plate 15, figs. 32, 33, and plate 32, fig. a

Thallus 2-5 cm. high, 2-2.5 mm. diam., attached by a relatively small holdfast, cylindrical above, somewhat flattened and profusely anastomosing at the base, branching dichotomous to sub-dichotomous above; utricles cylindrical, clavate to pestle-shaped, truncate to slightly round and smooth at the outer end, 400-500 μ long, up to 200 μ wide at the outer

end, terminal wall thickened, up to $20\ \mu$ thick; gametangia (?) broadly fusiform, $180\text{--}240\ \mu$ long, $60\text{--}70\ \mu$, up to $100\ \mu$ broad, not extending beyond the utricles.

Growing on rocks in the upper sublittoral belt.

Type: No. 1323, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 16), in June, at **Tortuga Island, Gulf of California.**

This species is to be distinguished by its small size, its relatively short utricles and especially by the profuse anastomosing of the fronds at the base. In this way small dense cushions are built up about a centimeter thick in which the fronds extend outwards more or less laterally. It is fruiting profusely and it is assumed to be nearing its maximum development.

***Codium reductum* S. and G. sp. nov.**

Plate 14, figs. 23, 24 and plate 33

Thallus 15 cm. high, decidedly flattened towards the base, nearly cylindrical at the apices, dichotomously branched, gradually reduced in width from the base to the extremities; segments between the forkings cuneate; utricles narrowly to broadly clavate, rounded and smooth or blunt-conical at the apices, sometimes branching, $600\text{--}800\ \mu$, up to $1250\ \mu$ long, up to $250\ \mu$ broad, terminal wall of utricle up to $30\ \mu$ thick, finely laminated, frequently umbonate; hairs numerous, attached very close to the ends of the utricles; gametangia (?) narrowly fusiform, $180\text{--}210\ \mu$, at times up to $440\ \mu$ long, $60\text{--}90\ \mu$ broad.

Growing on rocks in the lower littoral belt.

Type: No. 1324, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 42), in June, at **Angeles Bay, Lower California.**

In this species of *Codium*, as well as in many others, there is a marked variation in the size and shape of the utricles. A sort of dimorphism seems to exist regarding their size. There is a typical size and form, possessed of a liberal range of variation, and interspersed among these there is a much smaller number of very decidedly large specimens always

having much thinner end walls than the typical forms. The significance of this large type has not been interpreted. They bear gametangia (?) and are present in practically all of the species reported here.

Codium cuneatum S. and G. sp. nov.

Plate 16, figs. 34, 35 and plate 34

Thallus decidedly flabellate, attached by a relatively small spongy disk, 12-16 cm. high, branching very close to the base, regularly dichotomous, distinctly flattened, especially immediately below the forking, angles rounded; segments between the forkings broadly cuneate, up to 2 cm. wide below the forking, terminal branches numerous, much reduced; utricles 0.5-1 mm. long, 200-250 μ diam., large type up to 450 μ diam. at the outer end; side wall 2-3 μ thick, end wall 8-12 μ thick; hairs short, attached near the outer end of the utricles; sporangia sub-fusiform, widest below the center, 200-260 μ long, 90-110 μ wide; often extending beyond the utricle.

Growing on rocks in the upper sublittoral belt.

Type: No. 1325, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 47), in July, at **Smith Island, Gulf of California.**

The gross morphological features of this species, which distinguish it from all other known species, are the regularly dichotomous branching, the flattened and flabellate character of the frond, and the broadly cuneate segments between the forkings. These combined with the characters of the utricles and the gametangia are decidedly sufficient in our judgment to render this one of the most distinct of all the species of *Codium*.

The fronds are small at the base and the forking begins very close to the base. The specimens at hand are in full fruit and presumably are very near to maturity. They are forked about ten times. At each forking the frond widens rather decidedly and rapidly, reaching its greatest width at about the seventh forking, after which it is reduced very rapidly to the small apices only 2-4 mm. wide.

Its nearest relative would seem to be *C. Lindenbergii* Binder (in Kuetz., Tab. Phyc., vol. 6, pl. 97), but as described and figured, that species has longer and less cuncate segments and decidedly long and attenuated apices. Also the utricles as figured differ in shape from ours and are not represented as having thickened end walls.

***Codium amplivesiculatum* S. and G. sp. nov.**

Plate 15, figs. 28, 29 and plate 35

Thallus cylindrical, somewhat flattened at the forking, 5-6 dm. high, main branches 6-9 mm. diam. in widest part, tapering slightly towards the base, terminal ramuli 1-2 mm. diam.; branching profuse, regularly dichotomous; branches gradually and much reduced in diameter upward; utricles 1.4-1.8 mm. long, of two kinds, the typical, 350-550 μ diam. at the outer ends and the rarer, up to 1 mm. diam. at the outer end, clavate, enlarging gradually upward; walls thin, 1.5-2 μ on the sides, 3-4 times as thick at the ends; hairs inserted near the outer end of the utricle; gametangia (?) fusiform, 350-400 μ long, 90-120 μ broad.

Specimens found floating.

Type: No. 1326, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 74), in July, near south end of Angel de la Guarda, Gulf of California.

This species of *Codium*, according to the report by Mr. Johnston, is quite plentiful in the above mentioned locality. It was found growing in abundance and many specimens were floating in the bay. Only two complete specimens were collected. It seems to be very loosely attached by a small hold-fast. A very striking feature of the gross morphology is the very gradual attenuation of the fronds upward, the widest part being at the base.

It is probably to be considered a near relative of *C. decortiatum* (Woodw.) Howe (Phyc. Studies, V., p. 494), who determined a specimen of the Vives Collection from La Paz and sets forth his reasons in full for changing the combination. Our plants are larger and have much larger utricles and

the dichotomies are up to twelve, thus producing a very large number of slender branches.

The characters of the utricles are almost identical with those of *Codium longiramosum* of this paper.

***Codium unilaterale* S. and G. sp. nov.**

Plate 15, figs. 30, 31 and plate 36

Thallus cylindrical to somewhat irregular, 20 cm. high, 3-4 mm. diam. at the base, enlarging slightly upwards, subterminal segments widest, dichotomous to sub-distichous, branching very close to the base, angles narrow; utricles nearly cylindrical to narrowly clavate, smooth and rounded to slightly conical at the outer ends, 700-900 μ long, 200-250 μ , up to 400 μ , broad; hairs sparse, attached very close to the outer end of the utricles; gametangia (?) sub-fusiform, widest below the center, attached above the center of the utricles, often projecting beyond them, 225-270 μ long, 90-120 μ broad.

Growing on rocks in the upper sublittoral belt.

Type: No. 1327, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 74a), in July at Pond Island, near south end of Angel de la Guarda, Gulf of California.

One of the very striking characters of *Codium unilaterale* is the very unequal growth of one of the branches arising at the apex by an apparent equal splitting at the growing region. This method is prevalent throughout the plant and results in several main shoots with the branches all on one side, since with few exceptions it is the branch arising on the same side as the preceding branch which is reduced in growth.

***Codium longiramosum* S. and G. sp. nov.**

Plate 15, fig. 27 and plate 37

Thallus cylindrical throughout, 4 dm. high, 5-8 mm. diam., tapering decidedly towards the base to a small short stipe and only slightly towards the apices; branching dichotomous, mostly near the base, moderately sparse; utricles of two forms, the typical, with smaller dimensions, narrowly clavate to

slightly pestle-shaped, and the larger, fewer, up to 1.2 mm. diam., broadly clavate, interspersed among the typical, 1-1.8 mm. long, convex and smooth at the apices, with apical walls 8-14 μ thick; gametangia and zoosporangia unknown.

Type: No. 1328, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 74b), in July, floating in **Rattlesnake Harbor, Pond Island, Gulf of California.**

Codium longiramosum is to be distinguished from all other known species by its sparse dichotomous branching, taking place mostly near the base, its long straight cylindrical branches slightly attenuated toward the apices and decidedly so at the base, along with certain microscopic characters. The utricles are relatively very large, especially one type, which is not very abundant. The side walls are very thin and the end walls as compared with the size of the utricles and with most species are likewise thin. Unfortunately we have but a single specimen and it is sterile. The characters of the utricles are almost identical with those of *Codium reductum*, of this paper, with which it was found floating.

***Codium anastomosans* S. and G. sp. nov.**

Plate 16, figs. 36, 37

Thallus about 4 cm. long, 3-5 mm. diam., cylindrical, profusely anastomosing at the base, more or less spread out laterally, attached in the center by a disk-shaped holdfast and more or less by rhizoids along the prostrate fronds; branching sub-dichotomous; typical utricles narrowly clavate, at times branching, 45-70 μ diam., an occasional large thin-walled specimen reaching 290 μ diam.; apices mostly blunt conical, capped with a thick, hyaline, laminated cell wall, 35-50 μ thick, a few specimens up to 70 μ thick; gametangia unknown.

Growing on rocks.

Type: No. 1329, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 84e), in June, at **Angel de la Guarda, Puerto Refugia Rocks, Gulf of California.**

This species of *Codium* combines characters of several species apparently, which seem to be very closely related, and

possibly overlap each other. The profuse anastomosing of the fronds, spreading out laterally, forming more or less of a cushion, are characters slightly represented in *Codium cervicorne* and highly developed in *Codium conjunctum*. In thickness of frond and general method of branching it resembles *C. cervicorne*. The small size, the rounded to blunt-conical apices, and the decidedly thick end walls of the utricles are a combination of characters not found in any other species. Unfortunately we have but a single sterile specimen upon which to base the species, but its morphological characters seem too distinct not to warrant its being placed in a separate species, awaiting further investigation to establish well its entity.

***Codium Brandegeei* S. and G. sp. nov.**

Plate 14, figs. 25, 26 and plate 30

Thallus 10-12 cm. high, cylindrical to slightly flattened, tapering gradually from the base upwards, terminal segments 2-3.5mm. diam., branching dichotomous; hairs 2-3 in a whorl near the top of the utricles; utricles 750-850 μ long, variable in diameter, 50-200 μ at widest part, narrowly clavate, apices rounded to subconical, terminal wall 30-45 μ up to 60 μ thick, frequently umbonate; gametangia (?) mostly narrowly fusiform, 240-280 μ long, 70-90 μ broad.

Habitat unknown. La Paz (?). Type, Brandegee, no. 28.

We have but a single specimen upon which to base this species. It was collected by T. S. Brandegee many years ago and probably at La Paz. It seems most closely related to *C. simulans* of this paper.

***Codium cervicorne* S. and G. sp. nov.**

Plate 14, figs. 19, 20 and plate 32 b

Thallus cylindrical throughout, 4-6 cm. high, 3-5 mm. diam., attached by a relatively large spongy holdfast, several erect fronds arising from the same holdfast; branching sub-dichotomous, becoming almost unilateral towards the outer ends, angles wide and rounded; utricles 500-600 μ long,

75-225 μ in widest part, varying from narrowly cylindrical forms with end walls thickened up to 40 μ and more or less conical, to broadly clavate forms with end wall only slightly thickened and convex; gametangia (?) narrow-fusiform, 190-220 μ , at times up to 300 μ , long, 40-60 μ broad.

Cast ashore at Eureka, near La Paz, Lower California. Type, Marchant, no. 8, May.

Among the specimens of our collections of *Codiums* from the Gulf of California appear a few which although resembling *C. conjunctum* very closely as to form, are of a distinct species. It is to be distinguished from *C. conjunctum* in being a larger plant in all measurements, in having fewer branches, which are sub-dichotomous and almost unilateral, in having wider, rounder angles, and in having larger utricles and gametangia. There is a slight anastomosing of the fronds at the base, a character which is very prominent in *C. conjunctum*. The character of the branching reminds one of antlers of an elk.

Family CLADOPHORACEÆ

CHÆTOMORPHA KUETZING, Phyc. Germ., 1845, p. 203

Chætomorpha antennina (Bory) Kuetz.

Collected at Mazatlan, Mexico. Marchant, no. 100.

Kuetzing, sp. Alg. 1849, p. 379; Setchell and Gardner, Chlorophyceæ, 1920, p. 203. *Conferva antennina* Bory, Voy. quatre Îles d'Afr., vol. 2, 1804, p. 161. *Chætomorpha pacifica* Kuetzing, Sp. Alg. 1849, p. 379.

The cell walls of this collection, which seems to be thoroughly mature, are very thick, 60 μ above and up to 100 μ below.

CLADOPHORA KUETZING, Phyc. Gen., 1843, p. 262

Cladophora hesperia S. and G. sp. nov.

Plate 13, fig. 17

Fronds forming dense, thin mats on the substratum, profusely branched; di-trichotomous; main branches nearly uniform in diameter throughout, tapering only at the apices;

ramuli of different orders reduced in diameter at each forking and all tapering gradually to blunt apices; main filaments 190-230 μ diam., ultimate ramuli 25-40 μ diam.; main branches relatively strict, ramuli widely divaricate; segments slightly constricted at the dissepiments, 2-4 times as long as the diameter in the ramuli, up to 1 mm. long in the main filaments.

Growing in a muddy habitat, at the southern extremity of Lower California. Type, Brandegee, no. 21.

No data are available as to the habitat or the exact locality of this species of *Cladophora* nor the time of the year it was collected. The locality is undoubtedly along the coast of the southern extremity of Lower California, where Mr. Brandegee collected many flowering plants. Only a single mount was preserved, consisting of a mat of material about three inches square. There are a few fronds of a small *Enteromorpha* mixed with it, and the mass is quite muddy, indicating that the probable habitat is a mud-flat. There is no indication available as to the nature of attaching portions. The chromatophores, difficult to interpret in old dried material, occupy the periphery of the whole segment, both ends and sides, forming a thin stratum seemingly composed of closely crowded fine disks. The branching is very profuse, especially the ramuli of the fourth to sixth orders which extend in all directions and arise at almost right angles with the parent branch. The species is especially characterized by its profuse, short, divaricate and subulate ramuli.

CLADOPHOROPSIS BÖRGESÉN, *Cont. Conn. du genre Siphonocladus*, 1905, p. 259

***Cladophoropsis robusta* S. and G. sp. nov.**

Plate 13, fig. 16

Fronds forming extensive dense tufts, 3-3.5 cm. high, attached by numerous branching rhizoidal filaments; erect filaments nearly cylindrical throughout, up to 1100 μ diam., sparsely forked at the base and bearing a few short lateral branches near the apex; segments very long except in the region of branches.

Growing on rocks in the upper sublittoral belt.

Type: No. 1330, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 135), in June, at Tortuga Island, Gulf of California.

This species may readily be distinguished from all other known species of *Cladophoropsis* by the large diameter and by the great length of the segments between the branches.

Family ULVACEÆ

ENTEROMORPHA LINK, Epistola, 1820, p. 5

Among the collections of *Enteromorpha* from the Gulf of California at our disposal, we have identified four different known species, all of which, as far as we are able to ascertain, are new to the Gulf, and one species new to science. Doubtless others exist but have escaped collectors' notice.

Enteromorpha acanthophora Kuetz.

Plate 16, fig. 43 and plate 38

Cast ashore at Guaymas, Marchant, no. 1, May. On rocks in the lower littoral belt, Johnston, no. 39, June. La Paz (?) Brandegee, No. 29.

These specimens agree very well in habit with Kuetzing's figure of this species, Tab. Phyc., vol. 6, pl. 34. The specimens collected by Brandegee are probably older and do not seem quite typical in this stage of its life history. The plant figured (loc. cit.) is of a specimen of Johnston's collection, no. 39, June.

Enteromorpha prolifera (Muell.) J. Ag.

Cast ashore at Guaymas, Mexico, Marchant No. 4, May.

Marchant's material appears to be quite typical of this species, as understood and figured by Kuetzing, Tab. Phyc., vol. 6, pl. 30, and by J. G. Agardh, Till. Alg. Syst., part 3, p. 129, pl. 4, figs. 103, 104.

Enteromorpha tubulosa Kuetz.

Cast ashore at La Paz, Lower California. Johnston, no. 49, April.

Kuetzing, Tab. Phyc., vol. 6, pl. 32, fig. 2.

The material of this species is rather sparse and seems not to be typical. It is sparingly branched above. The membrane is 34-40 μ thick, and the cells are 14-18 μ diameter, as seen from above. It does not agree completely with either *E. tubulosa* or *E. prolifera*, both of which it resembles, but is seemingly closer to the former, where we are placing it.

Enteromorpha compressa (L.) Grev.

Guaymas, Mexico, Brandegee no. 7, and La Paz, Lower California, Brandegee, no. 17.

Greville, Alg. Brit., 1830, p. 180, pl. 18. *Ulva compressa* Linnæus, Fl. Suec., Ed. II, 1755, p. 433.

As we understand this species (cf. Setchell and Gardner, 1920, p. 251, 252), the material cited here is fairly typical.

Enteromorpha Marchantæ S. and G. sp. nov.

Plate 16, figs. 40-42

Fronds 4-7 cm. high, up to 1 cm. wide in widest parts, tubular, more or less bullate, clavate, tapering below to a delicate stipe, simple or with a few branches like the main frond and with delicate proliferations on the stipe; cells in the smooth parts arranged more or less in longitudinal and in cross rows, mostly square in surface view, 16-22 μ diam., membrane 24-27 μ thick; cell walls 2.5-3.5 μ thick, not thickened on the inside; chromatophore not filling the cell, mostly in the outer end of the cell.

Cast ashore at La Paz, Lower California. Type, Marchant, no. 3, May.

In form this species seems most closely related to forma *clavata* of *E. intestinalis*. It differs from all of the forms of *E. intestinalis* in having a thin wall on all sides of the cell, in having the cells arranged more or less in longitudinal rows, and in having the cells nearly cubical. The specimens are very much smaller than typical *f. clavata*.

ULVA LINNÆUS, Gen. Plant., 1737, p. 326

In this account we have listed three species of *Ulva*, viz., *U. dactylifera* S. and G., *U. lactuca* L., and *U. rigida* Ag. Howe (1911, p. 490) reported *U. fasciata* Delile from La Paz and *U. lactuca rigida* (Ag.) Le Jolis from San Felipe Bay. We have not seen the material of these last two species but raise the question here whether the former may not be our *U. dactylifera* (S. and G., 1920, p. 272) and the latter one of the other species cited above.

***Ulva dactylifera* S. and G.**

Growing on rocks in the upper sublittoral belt, San Marcos Island, Gulf of California, Johnston, no. 11a, June; Tortuga Island, Gulf of California, Johnston, no. 31, June; La Paz, Lower California, Brandegee, nos. 9 and 30; Eureka, near La Paz, Marchant, no. 5, May.

Setchell and Gardner, Phyc. Cont. I, 1920a, p. 285, pl. 26, fig. 1, Chlorophyceæ, 1920, p. 272, pl. 21, fig. 1.

As a rule the specimens from the Gulf have a more ample base and shorter "streamers," otherwise they approximate very closely the California plants.

***Ulva rigida* Ag.**

Cast ashore, La Paz, Lower California. Marchant, no. 6, May.

Agardh, Sp. Alg., vol. 1, part 2, 1822, p. 410; Setchell and Gardner, Chlorophyceæ, 1920, p. 270.

We have three well preserved specimens of this species. All of them are somewhat smaller than the average size for this species. Structurally they seem typical of the species as we understand it.

***Ulva lactuca* L.**

Growing on rocks in the lower littoral belt. Los Angeles Bay, Lower California, Johnston no. 40, June; Guaymas, Mexico, Johnston, no. 63, April.

Linnæus, Sp. Plant., vol. 2, 1753, p. 1163 (in part); Setchell and Gardner, Chlorophyceæ, 1920, p. 265.

Family CHLÆTOPHORACEÆ

ENTOCLADIA REINKE, Zwei par. Algen, 1879, p. 476; Setchell and Gardner, Chlorophyceæ, 1920, p. 288

Entocladia condensata S. and G. sp. nov.

Plate 12, figs. 4, 5

Plants forming a disk of compact cells in the center, with a few short filaments extending outwards from the margin; cells in the center of the thallus 12-16 μ in surface view, angular; marginal filaments 7-9 μ diam.

Growing in the terminal membrane of the utricles of various species of *Codium*.

Type: No. 1331, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 26), in June, at San Francisquito Bay, Lower California.

E. condensata is quite similar to *E. codicola* S. and G., growing in the utricles of *C. fragile* (Suring) Hariot, on the coast of California, but the cells are much larger throughout and the whole plant is more condensed. It is apparently quite widely distributed on a number of different species of *Codium* in the gulf.

Entocladia Polysiphoniæ S. and G. sp. nov.

Plate 13, fig. 18

Filaments distinct, very crooked, irregularly and much branched, branches often at right angles, arising from the middle of the cell, not coalescing in the center of the thallus to form a disk; cells very variable in shape and size, 4-9 μ diam., 3-6 times as long as the diameter; chromatophores parietal, pyrenoid single; zoosporangia (?) intercalary; formed from vegetative cells at irregular intervals in the filaments, numerous, up to 24 μ diam.; thallus up to 1 mm. diam.

Growing in the membrane of *Polysiphonia Marchantii*. Guaymas, Mexico, Marchant, no. 50b, May; La Paz, Lower California, Bryant, no. 7a. *Type*, Marchant, no. 50b.

In a previous work (Chlorophyceæ, 1920, p. 289, 290) we discussed briefly the genus *Entocladia*, setting forth our con-

ceptions of it, and expressed our difficulties in arriving at a complete and satisfactory arrangement of our Pacific Coast forms, owing to incomplete life histories of the organisms. We are compelled to acknowledge that the same difficulties stand in the way of disposing of these Mexican forms. Notwithstanding the presence of well developed sporangia (?) or gametangia (?) with completely formed reproductive cells within them, we are unable to say whether the reproduction is asexual or sexual, or whether the reproductive cells have two or four cilia, important matters in establishing relationships. All of our species thus far located on the Pacific Coast of North America are endophytic. They branch more or less abundantly, have a single parietal chromatophore and one pyrenoid.

We have in the three species, here newly proposed, apparently represented the extremes of variation in the matter of the formation of the thallus. In *E. condensata* the whole plant is practically a solid parenchymatous disk, with only a few peripheral short free filaments. In *E. Polysiphoniæ* there is no indication of a central parenchymatous disk. The filaments are all free, more or less crooked and distorted, and the branching is alternate or at times secund, usually arising from the center of the cells. Between these two extremes we have *E. codicola* S. and G. with a slight central disk, *E. mc.ricana* of this paper, and *E. cingens* S. and G. In all cases the reproductive cells are merely vegetative cells enlarged and more or less metamorphosed. In *E. Polysiphoniæ* those of the central part of the thallus are enlarged to almost spherical whereas those near the margin may only be slightly swollen. This condition does not seem to be the case in the other species.

***Entocladia mexicana* S. and G. sp. nov.**

Plate 19, fig. 57

Thallus wholly endophytic, 350-450 μ diam., parenchymatous in the center with copious free filaments around the margin; cells in the center nearly equidiametric, 15-18 μ diam., cells of the free filaments 5-7 μ diam., 1.5-2.5 times as long; zoosporangia (?) scattered, numerous, up to 20 μ diam.

Growing within the membrane of *Chaetomorpha antennina*.

Type: No. 1332, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 49b), at **La Paz, Lower California**.

PRINGSHEIMIA REINKE, Einige neue braune und grüne Algen. 1888, p. 241

Pringsheimia Marchantæ S. and G. sp. nov.

Plate 12, fig. 8

Thallus epiphytic, up to 280 μ diam., often numerous and confluent on the host; cells in the center of the thallus nearly isodiametric, 15-20 μ diam., much reduced and elongated radially towards the margin, 3-4 μ diam., 2-3 times as long; chromatophore parietal; pyrenoid single; reproduction unknown.

Growing on various species of *Laurencia*. La Paz, Lower California. Type, Marchant, no. 68x, May.

We have seen neither gametes nor zoospores either in position or free. However, very frequently the cells in the center of the thallus are empty and we are therefore assuming that the plants are mature. If this is the case, *P. Marchantæ* is quite distinct from *P. scutata* Reinke, which has the reproductive cells very much elongated in the center of the host. The shape and size of the cells on the periphery are decidedly different from those of *P. scutata*, being much smaller and longer. It has no resemblance to *P. (?) Udotca* Børgesen, 1913, p. 11. We mark it as a new species pending further investigation.

MELANOPHYCEÆ

Family ECTOCARPACEÆ

ECTOCARPUS LYNGBYE, Hydrophyt. Dan., 1819, p. 130

Ectocarpus Bryantii S. and G. sp. nov.

Plate 17, fig. 45

Fronds intertwined, forming a more or less continuous stratum, 1-2.5 mm. high, attached by relatively short, penetrating, rhizoidal filaments; erect filaments forked more or

less at the surface of the host, with very few short ramuli above, nearly cylindrical, tapering slightly above, uncorticated; terminal cell blunt 28-32 μ diam., cells 1-2 times as long as broad; chromatophores small disks; zoosporangia unknown; gametangia narrowly to broadly fusiform, sessile or on 1-celled pedicels, 70-100 μ , up to 140 μ , long, 25-35 μ broad, scattered promiscuously along the whole length of the erect fronds.

Growing on *Codium Brandegeei*. La Paz, Lower California. Type, Bryant, no. 3a.

Ectocarpus Bryantii and *E. gonodioides* are evidently closely related to each other and both have near affinities in the *pusillus* group of Sauvageau (1895). They both differ from all of the forms proposed, in the method of branching and in having no hairs terminating the erect filaments.

***Ectocarpus gonodioides* S. and G. sp. nov.**

Plate 17, fig. 44

Fronds minute, forming small tufts 500-550 μ high, attached by long, more or less hyaline rhizoidal filaments penetrating the host; filaments sparsely branched at the surface of the host, tapering rather abruptly at the base, long attenuated upward to a blunt apex, 18-24 μ diam. at the base, 10-14 μ at the apex; cells 1-2 times as long as broad; zoosporangia unknown; gametangia narrowly fusiform on 1-2 celled pedicels, near the base of the erect filaments, up to 125 μ long. 20-28 μ diam. in widest part.

Growing on *Codium cuneatum*.

Type: No. 1333, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 47e), in July, at **Smith Island, Gulf of California**.

The small tufts which this species of *Ectocarpus* produces remind one of the genus *Gonodia* (*Myriactis*), but the penetrating part, which extends relatively deep into the host, is composed of slender, almost colorless, slightly branched, closely intertwined filaments, which, however, do not coalesce or form a false parenchyma as in the case of some species of

Gonodia. The plants, though sparse, are in excellent fruiting condition. The chromatophores are too much disorganized for characterization.

Family CORYNOPHLOEACEÆ

GONODIA NIEUWLAND, Critical notes, IX, 1917, p. 30, *Myriactis* auct.

As pointed out by Nieuwland (1917, p. 30), *Myriactis* was applied by Lessing to a still recognized genus of flowering plants belonging to the Compositæ, in 1831. It became necessary, therefore, to adopt another generic name for the algæ which have been listed under this name and Nieuwland has proposed the name *Gonodia*, in honor of Eugene Gonod, and has made the new combination *Gonodia pulvinatum* (Kuetz.) Nieuwland (*loc. cit.*). As far as we know there have been but two other unmistakable species of the genus described. We are here making these new combinations and adding two new species.

***Gonodia Sargassi* (Yendo) S. and G. comb. nov.**

Myriactis sargassi YENDO, *Novae Alg. Japon.*, 1920, p. 3

***Gonodia moniliformis* (Foslie) S. and G. comb. nov.**

Elachista moniliformis FOSLIE. *Myriactis moniliformis* (FOSLIE) KVILIN, *Zur Kenntnis der Algenfl.*, 1910, p. 13, fig. 3

***Gonodia Johnstonii* S. and G. sp. nov.**

Plate 17, figs. 46, 47

Plants forming dense minute tufts in the conceptacles and on other parts of the host, 160-200 μ high, attached by rather deeply penetrating, sparsely branched, rhizoidal filaments; erect fronds forked at the surface of the host, vegetative filaments unbranched above, decidedly clavate and blunt, at times tapering upwards above the center; cells in widest part 10-14 μ diam., 1-1.5 times as long as broad, slightly constricted at the dissepiments; zoosporangia broadly clavate, 65-75 μ long, 18-22 μ broad; gametangia cylindrical, 60-75 μ long, 6-9 μ

broad, densely fasciculate; both sets of reproductive organs borne on the same plant at the surface of the host.

Growing on *Sargassum insulare*.

Type: No. 1334, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 11b), in June, at San Marcos Island, Gulf of California.

Gonodia Marchantæ S. and G. sp. nov.

Plate 17, fig. 48

Fronds forming dense tufts with a pseudoparenchymatous base penetrating the host, the free portion about 200 μ long; filaments unbranched above the host, the lower portion composed of 2-3 long, narrow cells, abruptly changing into 2-3 asymmetrical swollen cells, then gradually attenuated upward to blunt apices; widest cells 18-22 μ , the length of the cells in the upper part equalling the breadth; pseudoparenchymatous cells doliiform to subspherical; zoosporangia broadly clavate, 55-65 μ long, 22-26 μ broad; gametangia cylindrical, densely fasciculate, 55-65 μ long, 6-7 μ broad; both sets of reproductive organs borne on the same plant at the base of the free filaments.

Growing on the fronds of *Sargassum horridum*, La Paz, Lower California. Type, Marchant, no. 22a, May.

G. Marchantæ differs from *G. Johnstonii* in the character of the basal penetrating portion, the former having few narrow filaments and the latter having a dense, copious, pseudoparenchymatous base. Two or three cells in the lower part of the free filaments are usually asymmetrical in *G. Marchantæ* and not so in *G. Johnstonii*. Neither species has hairs or any indication of having had them, a prominent character as figured by Thuret and Bornet in *Etudes Phyc.*, pl. 7, figs. 2-6, for *Elachista pulvinata*, and mentioned by Yendo as "paraphysibus paucioribus" in *Myriactis Sargassi* (*loc. cit.*). *G. Marchantæ* is close to *G. pulvinata* in the character of the basal penetrating portion. *G. Johnstonii* in general resembles *G. moniliformis* but is much smaller throughout.

Family MYRIONEMATACEÆ

COMPSONEMA КУСКУСК, Beitr. Kennt. Meeresalgen, 1899, p. 92

***Compsonema immixtum* S. and G. sp. nov.**

Plate 17, fig. 49

Thallus inconspicuous, the basal filaments creeping among the gametangia of the host; erect filaments very numerous, all bearing gametangia; hairs and zoosporangia unknown; gametangia narrowly ellipsoidal, 24-30 μ long, 6-8 μ broad.

Growing on *Colpomenia sinuosa* f. *deformans*.

Type: No. 1335, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 58b), in July, at **Isla Partida, Gulf of California**.

This organism is on the border between *Myrionema* and *Compsonema* as we interpret these two genera (S. and G. Phyc. Cont. II-VI, 1920). Under the present conditions of the host it is impossible to learn much of the basal portion. It appears that the basal layer was largely developed before the gametangia of the host started to develop. Later these pushed out among the basal filaments and leaving these behind developed along with the gametangia of the epiphyte. The gametangia project beyond the general surface of the host nearly their entire length. On account of the pluriseriate nature of the gametangia we are placing it in the genus *Compsonema* rather than in *Myrionema*.

Family SPHACELARIACEÆ

SPHACELARIA LYNGBYE, Hydrophyt. Dan., p. 130 (In part)

***Sphacelaria furcigera* Kuetz.**

Plate 19, fig. 58

KUETZING, Tab. Phyc., vol. 5, p. 27, pl. 90

A few tufts of a species of *Sphacelaria* which seems to be this species have been noted on different species of *Sargassum* from the Gulf. Marchant, No. 22b is a fruiting specimen, having apparently two forms of gametangia, represented on plate 19, fig. 58.

Sphacelaria brevicorne S. and G. sp. nov.

Plate 19, figs. 59, 60

Fronds 1-1.5 mm. high, attached by small penetrating filaments, branching very sparse and strict, 35 μ diam. below, 22-30 μ near the tip; hairs arising near the tips, composed of 6-8 cells; zoosporangia and gametangia unknown; propagula tricornute, about 120 μ long, about 70 μ wide below the horns, composed of a few large cells, on 2-3 celled pedicels; horns short, blunt, composed of 2-3 cells.

Growing on *Sargassum polyacanthum* f. *americanum*. La Paz, Lower California. Type, Brandegee, no. 59.

S. brevicorne has a very close affinity in *S. cornuta* Sauv. (1901, p. 132, Repr.), the type locality of which is New Caledonia. Unfortunately we have no fruit on ours. We are basing the distinction from *S. cornuta* largely on the differences in the character of the propagula.

Family ENCELIACEÆ

COLPOMENIA (ENDLICHER) DERBÈS and SOLIER, Mém. phys. Alg., 1856, p. 11, Endlicher, Gen. Plant., Suppl. III, 1843, p. 26, n, 98b

Colpomenia sinuosa f. tuberculata (Saunders) S. and G.

San Francisquito Bay, Lower California, Johnston, no. 26, June; Los Angeles Bay, Lower California, Johnston, no. 117, May; La Paz, Lower California, Marchant, no. 13, May, and Brandegee, nos. 15 and 36.

Setchell and Gardner, Alg. N. W. Amer., 1903, p. 242.

C. tuberculata Saunders, Phyc. Mem., 1898, p. 164, pl. 32, figs. 1-3.

The specimens of all of these collections are sterile. They are larger and seem somewhat more membranaceous than any which have been reported from the California coast, the type locality being Monterey, California. Otherwise they seem quite typical.

Colpomenia sinuosa f. deformans S. and G.

Plate 19, figs. 61, 62

Isla Partida, Gulf of California, Johnston, no. 58, July.
Setchell and Gardner (*loc. cit.*). *Scytosiphon bullosus*
Saunders, Phyc. Mem., 1898, p. 163, pl. 31, figs. 1-7.

There is an extensive variation in the form. The type locality of Saunders' *Scytosiphon bullosus* is Pacific Grove, California. The character which the plants assume growing along the California coast is about one-half bullose base and the other half consisting of irregular, more or less finger-like projections above. In the region of the San Juan Islands, Washington, the upper free portion is saccate and up to ten inches long. The basal portion of the material from the Gulf, as represented on plate 19, fig. 61, has practically disappeared and only the narrow, finger-like portions remain. The gametangia in this material are longer than in the material found along the California and Washington coasts.

Colpomenia sinuosa f. expansissima S. and G. f. nov.

Fronds 3-6 dm. in diam., thin, sinuose, with minute, spine-like projections.

Type: No. 1336, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 24), in June, at **San Francisquito Bay, Lower California.**

Johnston says in regard to the habitat: "Floating in large billowy masses out in the bay." Structurally the specimens seem very similar to *C. sinuosa f. expansa* Saunders (*loc. cit.*).

In his description Saunders does not mention the size of the plants. The specimens distributed in Collins, Holden, and Setchell, Phyc. Bor.-Amer., no. 825, from La Jolla, measure only a few centimeters in diameter. Comparison of the fruits cannot now be made, since our material is all sterile.

HYDROCLATHRUS BORY, in Dict. Class., vol. 8, 1825, p. 419

Hydroclathrus clathratus (Bory) Howe

Cast ashore, La Paz, Lower California. Marchant, no. 12;
Brandege, no. 11.

HOWE, ALGÆ in Britton and Millspaugh, Bahama Flora, 1920, p. 590

Hydroclathrus cancellatus Bory (*loc. cit.*)

Encalium clathratum (BORY) Ag. Sp. Alg. vol. 1, 1822, p. 412

This alga has been known for a century or more and has been collected from a large number of widely separated localities, yet very little seems to be known of its method of development and the characters of its fruit. Harvey (1852, p. 120) expresses doubt as to whether all of the plants referred to this species actually belong to it. We are referring here the collections from La Paz with some hesitation, as we have no fruit to give a clue to its relationship. Statements concerning the fruit have been vague. Harvey (*loc. cit.*, p. 119) quotes Montagne, without citation, thus: "Spores minute, globose, collected into dot-like, scattered innate *sori*, accompanied by club-shaped, jointed filaments."

Farlow (1881, p. 88) states that *Hydroclathrus* has plurilocular sporangia like *Phyllitis* and *Scytosiphon*, but did not state whether he referred to *Hydroclathrus sinuosus* or to *H. cancellatus*. Mitchell (1893, p. 53), in considering the structure of *Hydroclathrus* Bory, treats *H. sinuosus* Zanard. along with *H. cancellatus*. She states (p.56), referring to *H. cancellatus*: "While one region of the thallus is fully formed and capable of producing sporangia, another may be still in a state of growth." . . . "On all the branches cryptostomata and sporangia are present in various stages of development." She did not figure the sporangia but we presume she referred to a type similar to that in *H. sinuosus* (*Colpomenia sinuosa*). Aside from these statements, so far as we are aware no one else has described or figured the fruit.

CHNOOSPORA AGARDH, J. Nya Alg., 1847, p. 7

***Chnoospora pacifica* J. Ag.**

Cast ashore, La Paz, Lower California. Marchant, no. 16; Brandegee, no. 39.

J. Agardh, Nya. Alg., 1847, p. 7; Kuetzing, Tab. Phyc., vol. 9, 1859, pl. 86, fig. 1. *Chnoospora fastigiata a pacifica* J. Agardh, Sp. Alg., vol. 1, p. 172.

Our material is in fine vegetative condition but has no fruit. It does not perfectly coincide with Kuetzing's figure in its vegetative character. The plants are dichotomously branched and the older parts are at times flattened. The terminal portions are profusely branched, forming short, dense clusters with divaricate branches, while the terminal ramuli, as shown in Kuetzing's figure, are few and erect. Kuetzing's figures were doubtless drawn from material of the type from the type locality, St. Augustine, Mexico.

Family LAMINARIACEÆ

MACROCYSTIS AGARDH, Sp. Alg., vol. 1, part 1, 1821, p. 46

***Macrocystis pyrifera* (Turner) Ag.**

Caught on log line of vessel between Espiritu Santo Island and La Paz, Lower California. Johnston, no. 78, April.

Agardh (*loc. cit.*), *Fucus pyriferus* Turner, Fuci, vol. 2, pl. 110.

A single specimen about three feet long was brought aboard the vessel but no specimens were found growing attached within the Gulf.

Family DICTYOTACEÆ

NEUROCARPUS WEBER and MOHR, Beitr. Naturk., vol. 1, 1805, p. 300 (242-246)

***Neurocarpus zonarioides* (Farlow) Howe**

Growing on rocks in the upper sublittoral belt. Tortuga Island, Johnston, no. 22, June; Isla Partida, Johnston, no. 83, July.

Howe, Mar. Alg. Peru, 1914, pp. 69, 70. *Dictyopteris zonarioides* Farlow in Erythea, vol. 7, no. 8, 1899, p. 73.

The material of these collections seems to be identical with the material of *Dictyopteris zonarioides* Farlow, distributed from southern California in Collins, Holden, and Setchell, Phyc. Bor.-Amer. (Exsic), no. 581.

Howe (1914, p. 69) has brought forward new facts as to the priority of *Neurocarpus*, and it seems best to adopt this generic name rather than *Dictyopteris* or *Haliseris*.

Farlow (*loc. cit.*) compares the California specimen with *D. undulata* Holmes and properly, in our judgment, regards it as distinct.

Our plants are not fruiting and hence they are probably winter fruiting forms in that locality.

PADINA ADANSON, Fam. Pl., vol. 2, 1763, p. 13

Padina Durvillæi Bory

Growing in the lower littoral and upper sublittoral belts. Guaymas, Mexico, Marchant, no. 11a, May; Brandegee, no. 8. Eureka, near La Paz, Lower California, Marchant, no. 32, May. La Paz, Lower California, Marchant, no. 15, May. Bryant, no. 8. San Marcos, Johnston, no. 3, June. Tortuga Island, Johnston, no. 17, June. San Esteban, Johnston, no. 54, April. Georges Island, Johnston, no. 73, April. San Francisquito Bay, Johnston, no. 76, June. San Pedro Martir, Johnston, no. 150, April. Isla Partida, Johnston, no. 154, April.

Bory, Dict. Class., vol. 12, 1827, p. 591; Voy. Coquille, 1828, p. 147, pl. 21, fig. 1.

Among these various collections there is a great variation in the size, thickness, and amount of laceration, as well as the arrangement of the fruit. Without more critical study of the material in its native habitat and histological comparison we are unable to state whether we are dealing with one or more than one species. We are grouping them all under the above name for the present without further comment.

Dictyota LAMOURoux Nouv. Bull., Sci. Soc. Philom., vol. 1, 1809, p. 331

Dictyota crenulata J. Ag.

Plate 18, figs. 50, 51

Cast ashore, La Paz, Lower California. Brandegee, no. 24. J. Agardh, Nya. Alg., 1847, p. 7.

The collection listed above agrees very well with Agardh's brief description. We have not seen the type which is from St. Augustine, Mexico. The illustration (plate 18, fig. 50) is of a typical specimen of our collection in an advanced stage of development. The numerous proliferations represent plantlets developed from spores in situ.

Dictyota Johnstonii S. and G. sp. nov.

Plate 18, figs. 54-56 and plate 39

Fronds 12-16 cm. high, 5-8 mm. wide, 125-135 μ thick, composed of a single layer of large medullary cells surrounded by a single surface layer of small cells except in the lower part along the margin the medullary and surface cells become doubled; slightly stupose at the base, pinnate, dichotomously branched, angles acute to somewhat rounded, branches strict, margins smooth, color dark brown, black on drying; oogonia aggregated into elliptical or elongated areas, 115-125 μ long, 80-90 μ wide; tetrasporangia and antheridia unknown.

Growing on rocks in the upper sublittoral belt, San Marcos Island, Gulf of California, Johnston, no. 4, June.

Type: No. 1337, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 81), in July, at **Isla Partida, Gulf of California.**

Dictyota Johnstonii appears to belong to the subgenus or section of the genus, *Strigocarpus* J. Ag. (Anal. Algol. cont. 1, 1894, p. 73) and related to *D. pinnatifida* Kuetz., Tab. Phyc., vol. 9, 1859, p. 16, pl. 39, fig. 1, to *D. Pappeana* Kuetz. (*loc. cit.*, pl. 38, fig. 2), and to *D. liturata* Kuetz. (*loc. cit.*, fig. 1). The cross section in the central and lower parts of the frond has a structure similar to that shown by Okamura (1913, p. 33, pl. 109, figs. 3 and 7) for *D. marginata*. In *D. Johnstonii* the margins are thickened by divisions of the

cells of both the medulla and the surface while in *D. marginata* increase in thickness is brought about by division of the medullary cells only.

***Dictyota hesperia* S. and G. sp. nov.**

Plate 18, figs. 52, 53

Fronds linear, repeatedly branched, 8-10 cm. high, 2-4 mm. wide, 80-120 μ thick, more or less finely stupose at the base, dichotomously or at times subdistichously branched, antheridia and oogonia distributed over both surfaces on the same frond, oogonia single and antheridia in small circular groups; tetrasporangia single or in small irregular groups; oospores germinating freely in position.

Growing on rocks in the lower littoral and upper sublittoral belts, San Marcos Island, Gulf of California, Johnston, no. 5, June.

Type: No. 1338, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 32), in June, at **Tortuga Island, Gulf of California.**

Dictyota hesperia seems to belong to the subgenus or section of the group designated as *Pleiadophora* by J. Agardh (*loc. cit.*, p. 69) with close affinity with *D. sandvicensis* Sond.

New plants may be freely formed by growth of the oospores in position in the fronds. We have not been able to investigate the cytological characters of these spores to ascertain whether growth follows fertilization or whether the spores germinate parthenogenetically.

Family **SARGASSACEÆ**

SARGASSUM AGARDH, Sp. Alg., vol. 1, part 1, 1820, p. 1

In the posthumous publication of Grunow's work (1915-1916) two hundred and thirty species, besides a large number of varieties and forms of *Sargassum*, are listed. Notwithstanding this large number of published species, we find, in the region covered by our account, a considerable number of *Sargassums* which do not coincide with any of Grunow's

descriptions. We feel compelled, therefore, to propose fifteen additions, leaving several others for future investigation, on account of lack of fruit and herbarium material with which to compare sterile specimens.

***Sargassum acinacifolium* S. and G. sp. nov.**

Plate 21, fig. 82

Basal parts unknown; branches terete, smooth; leaves 12-16 mm. long, asymmetrical, the upper margin concave and smooth, the lower margin and apex coarsely dentate, ecostate, cryptostomata absent; vesicles situated at the base of the receptacles or more rarely among the receptacles, subspherical, smooth, apiculate, 1.5-2.5 mm. diam., on pedicels shorter than the diameter; receptacles 2-3 times forked, nearly cylindrical, not spiny, acuminate, more or less denticulate towards the apices.

Cast ashore. Guaymas (?), Mexico. Type, Brandegee, no. 2.

This species of *Sargassum* is a near relative, apparently, to *S. lapazanum* and to *S. Bryantii*, both of this paper, but it differs sufficiently in leaf, bladder, and receptacle characters to warrant giving it a separate characterization.

***Sargassum guardiense* S. and G. sp. nov.**

Plate 19, fig. 64

Basal parts unknown; primary branches up to 5 dm. high; secondary branches long and slender; branches and ramuli all smooth, terete; leaves slightly flattened, to filiform, ecostate, margins smooth, cryptostomata absent or rare; vesicles situated at the base of the fructiferous ramuli or among the branches of the receptacles, subspherical to slightly cylindrical, 2-4 mm. long, smooth, tapering at both ends, apiculate, on pedicels shorter than the diameter; receptacles 1-3 times forked, terete, not spinose, 5-8 mm. long, forming with the vesicles short heteroclyte cymes.

Cast ashore at Angel de la Guarda Island, Gulf of California.

Type: No. 1339, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 2), in June, at **Angel de la Guarda, Gulf of California**.

Unfortunately we have no complete specimens of this seemingly very well defined species of *Sargassum*. The character of the holdfast and of the main stipe, which are in many instances of much value in classification, cannot be stated. We have several clean primary branches which are in good fruiting condition and otherwise seemingly characteristic. The loose, open character of the branching and the shape and size of the vesicles remind one very much of some members of the genus *Cystophyllum* J. Ag. It has perhaps its nearest relative in *S. carpophyllum* but differs in leaf characters and in the vesicles being regularly lateral or terminal to the receptacles.

***Sargassum lapazeanum* S. and G. sp. nov.**

Plate 20, fig. 74

Fronds 4.5-6 dm. high, arising from a solid parenchymatous disk; stipe 1.5 cm. long; primary branches 5-7, terete, smooth, giving rise to numerous long, slender, secondary branches; leaves 0.5-1.5 cm. long, asymmetrical, widest towards the apices, with very short petioles, the basal half of the upper margin smooth and concave, the remainder of the blade sharply dentate, midrib inconspicuous, cryptostomata abundant and conspicuous; vesicles scattered among the receptacles, ellipsoidal, 1-2 mm. long, transformed from the base of a leaf, mostly crowned by the remnants of the blade; receptacles 4-7 mm. long, 2-3 times forked, branches strict, spinulose, intermixed with leaves and receptacles forming a heteroclyte cyme.

Cast ashore, La Paz, Lower California. Type, Marchant, no. 21, May.

***Sargassum Bryantii* S. and G. sp. nov.**

Plate 21, fig. 83

Basal parts unknown; branches terete, more or less contorted; leaves 6-12 mm. long, 0.5 as broad as long, ecostate, asymmetrical, the upper margin concave and smooth, the

lower margin and the end unevenly serrate; cryptostomata few and irregularly placed; vesicles numerous along the ramuli or more rarely intermixed with the receptacles, subspherical, marginate when young, spinose, short-petiolate; receptacles short, 4-8 mm. long, 1.5-3 mm. broad, irregular, cylindrical below, blunt or pointed, at times slightly spinose and crowned with a rudiment of a leaf.

Cast ashore near La Paz, Lower California. Type, Bryant, no. 5.

The characters of the receptacles do not agree in every particular with those given by J. Agardh (Sp. Sargas. Austral.) in his key to *Eusargassum*. They are not regularly two-edged and serrate-dentate along the margins. Many of them are slightly flattened above, somewhat spinose, and crowned with a leaf rudiment. It fits into this section better than into any other.

Sargassum horridum S. and G. sp. nov.

Plate 20, figs. 65, 66

Basal parts unknown; branches and branchlets muricate, leaves linear-lanceolate, acute, midrib percurrent, margins deeply and doubly serrate; cryptostomata numerous and conspicuous on the leaves, stems and vesicles; vesicles sparse, occupying the position of leaves near the base of the ramuli or scattered among the receptacles, spherical, 4-8 mm. diam., short-petiolate; receptacles decompoundly ramose, decidedly spinose.

Cast ashore, La Paz, Lower California. Type, Marchant, no. 22, May.

Like the majority of our specimens from the Gulf of California, the specimens of this species of *Sargassum* have no holdfast or stipe. Presumably many of them grow only in the sublittoral belt and collectors have observed only such specimens as have been cast ashore, and these are usually fragmentary. Otherwise the specimens of *S. horridum* are in excellent condition.

Sargassum Marchantæ S. and G. sp. nov.

Plate 19, fig. 63

Basal parts unknown; primary branches 4.5-6 dm. high, terete, smooth; secondary branches numerous, densely fructiferous; leaves 4-6 cm. long, 3-5 mm. wide, linear-lanceolate acute, midrib percurrent, margins irregularly serrate-dentate; cryptostomata numerous and conspicuous; vesicles sparse, spherical, on short pedicels near the base of the ramuli or near the base of the branching receptacles, 4-6.5 mm. diameter, smooth; receptacle several times forked, occasionally one fork develops into a leaf or a vesicle forming a "heteroclyte cyme(?)," but all others fructiferous and from a single pedicel, supported near the base of a leaf, cylindrical, blunt, spinulose, the whole cyme 10-15 mm. long.

Cast ashore, Eureka, near La Paz, Lower California. Type, Marchant, no. 17, May.

Sargassum Marchantæ is probably genetically related to *S. Liebmanni* J. Ag.

Sargassum insulare S. and G. sp. nov.

Plate 20, figs. 67, 68 and plate 21, fig. 78

Fronds 7-9 dm. high, arising from a parenchymatous disk; stipe small, 5-10 mm. long; primary branches cylindrical throughout, 1-2 mm. diameter, smooth, moderately and alternately branched; leaves 1-2 cm. long, about half as wide as long, asymmetrical, the upper margin concave and mostly smooth, the lower margin and apex convex and crenate or dentate, ecostate; cryptostomata sparse; vesicles intermingled with the receptacles, spherical or sub-spherical, 1.5-2.5 mm. diameter, short-petiolate, often crowned by the remnant of a leaf; receptacles moderately branched, standing on a single pedicel on the base of a leaf, irregular in shape, clothed with scattered blunt spines, sometimes crowned by a rudiment of a leaf.

Growing on rocks in the upper sublittoral belt.

Type: No. 1340, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 11), in July, at **San Marcos Island, Gulf of California.**

Sargassum Brandegeei S. and G. sp. nov.

Plate 21, fig. 79

Basal parts unknown; branches and branchlets terete, smooth, without cryptostomata; branching rather dense in the upper parts; leaves 15-25 mm. long, 4-8 mm. wide, apices blunt, base cuneate, margins deeply serrate, cryptostomata absent; vesicles spherical, small, 2-3 mm. diam., smooth, apiculate or crowned by a rudiment of a leaf, supported by pedicels mostly shorter than their diameter, occupying positions of leaves toward the base of the ramuli, or scattered among the receptacles; receptacles in short dense racemes, with short distinct pedicels below but with sessile branches above, mostly blunt.

Cast ashore, Guaymas (?), Mexico. Type, Brandegee, no. 4.

Sargassum sinicola S. and G. sp. nov.

Plate 20, fig. 73

Basal parts unknown; branches and branchlets smooth, terete; leaves linear-lanceolate, acute, margins serrate-dentate, midrib percurrent, cryptostomata sparse, inconspicuous; vesicles numerous, mostly borne near the base of pedicel supporting the receptacles, spherical, smooth, 3-5 mm. diam., pedicels equaling the diameter; receptacles 1-3 times forked, the lower pedicellate, the upper sessile, cylindrical, with acuminate apices, not spinose.

Cast ashore. Eureka, near La Paz, Lower California; Marchant no. 20, May; La Paz, Lower California, Marchant, no. 26, May. Type, Marchant, no. 20.

This species seems nearly related to *S. podacanthum* Sond. and to *S. spinuligerum* Sond. but the leaves are much more "glandular" and the receptacles much more branched.

Sargassum polyacanthum f. americanum S. and G. f. nov.

Basal parts unknown; branches and branchlets up to 1.5 mm. diameter, moderately muricate; leaves 3-4 cm. long, narrowly lanceolate, acute, margins serrate-dentate, midrib percurrent, cryptostomata sparse; vesicles spherical, smooth,

up to 8 mm. diameter, occupying positions of leaves along the ramuli or at times supported by a leaf; receptacles 1-2 times forked, 2.5-4 mm. long, obtuse-conical.

Cast ashore, La Paz (?), Lower California. Type, Brandegee, no. 27.

This species stands very close to *S. spinuligerum* Sond. The leaves are longer and narrower than in that species. There are also other specific differences.

***Sargassum Johnstonii* S. and G. sp. nov.**

Plate 20, fig. 72 and plate 21, fig. 80

Basal parts unknown; primary branches relatively robust, terete, smooth, up to 8 dm. long, secondary branches numerous, densely crowded with fructiferous ramuli; leaves narrowly lanceolate, ecostate, margins sparsely denticulate, cryptostomata almost absent, 1.5-2.5 cm. long, 2-4 mm. wide; vesicles smooth, narrowly elliptical, merging gradually below into a short petiole, crowned by a mucron or a remnant of a blade, scattered along the fruiting rhachis among the receptacles, 3-5 mm. long, on pedicels shorter than their length; receptacles single or 2-3 times forked, nearly cylindrical, mostly blunt, with slightly denticulate apices.

Cast ashore.

Type: No. 1341, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 71), in April, at **Georges Island, Gulf of California.**

Related to *S. galapagense* Grun. but differs in having elongated, long-apiculate vesicles and slightly denticulate receptacles, and in details of leaf characters.

***Sargassum Johnstonii* f. *laxius* S. and G. f. nov.**

Plate 21, figs. 75 and 81

Basal parts unknown; primary branches up to 13.5 dm. long, secondary branches very much less frequent and much longer than in the species; leaves filiform, 1-2 cm. long, cryptostomata sparse, inconspicuous; vesicles subspherical, mostly long-mucronate; receptacles 1-2 times forked, rarely simple, not denticulate.

Cast ashore at Guaymas, Mexico. Type, Marchant, no. 28.

This variety differs from the species in the following particulars: the secondary branches and fructiferous ramuli are very much more widely scattered and several times longer, the leaves are narrower, in fact they are filiform, the vesicles are very much shorter, about one and a half times as long as broad, and the receptacles are less branched and rarely if ever denticulate at the apices.

***Sargassum Johnstonii* f. *gracile* S. and G. f. nov.**

Plate 21, fig. 76

Basal parts unknown; branches of all orders very slender, long, and wide apart, up to 1 mm. diam.; leaves filiform; vesicles narrowly ellipsoidal.

Cast ashore, Guaymas, Mexico. Type, Marchant, no. 28a.

This differs from the species in being decidedly more slender throughout, much less frequently branched, and in having the branches much longer and more delicate, and in having filiform leaves. In these respects they more nearly coincide with f. *laxius* but are much more delicate throughout than that form. The receptacles are young in the specimens at hand. The vesicles are practically the same in form as those of the species.

***Sargassum cylindrocarpum* S. and G. sp. nov.**

Plate 21, fig. 77

Basal parts unknown; primary branches and branchlets smooth, terete; leaves 5-8 cm. long, 3-5 mm. wide, linear-lanceolate, acute, serrate-dentate, midrib percurrent, cryptostomata abundant and conspicuous; vesicles 5-8 mm. diameter, spherical, smooth, on stipes shorter than the diameter, occupying positions of leaves toward the base of the fructiferous ramuli; receptacles several times forked, cylindrical, blunt, 1-2 cm. long.

Cast ashore, La Paz, Lower California. Type, Marchant, no. 11.

Sargassum herporhizum S. and G. sp. nov.

Plate 20, figs. 69-71

Fronds 6-8 dm. high, attached at first by a small parenchymatous disk, later the short stipe giving rise to erect primary branches in part and to horizontal branches which in turn develop attaching branches, hapteres, below and to erect branches above; primary branches slender, terete, smooth, densely clothed with leaves and with scattered secondary branches below and with fructiferous branches above; lower leaves sub-linear, upper linear-lanceolate and acute, lower 3-5 mm. broad, upper 1-2 mm. broad, midrib percurrent, margins sparsely denticulate, cryptostomata absent; vesicles numerous, scattered among the receptacles, spherical to subspherical, smooth, rarely apiculate, 1-2 mm. diam., on pedicels as long as or longer than the diam.; receptacles short, 5-10 mm. long, sub-cylindrical, acuminate, only sparsely branched, tuberculate with conspicuous conceptacles; plants very dark on drying.

Growing in the upper sublittoral belt.

Type: No. 1342, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 72), in April, at Georges Island, Gulf of California.

Arrangement of the species of *Sargassum* found on the Pacific Coast of North America according to the system of Agardh (1889) as revised by Grunow (1915-1916).

Subgenus *Phyllotrichia*Tribe V. *Dimorphæ*1. *S. Palmeri* GrunowSubgenus *Eusargassum*Series I. *Zygocarpicæ*Tribe I. *Carpophylleæ*

* Receptacles terete, not spiny.

℄ Rachides terete or nearly so.

2. *S. acinacifolium* S. and G. sp. nov.3. *S. guardiense* S. and G. sp. nov.

4. *S. lapazeanum* S. and G. sp. nov.
 ** Receptacles 2-edged (subangular), apex and
 margin serrate-dentate.
5. *S. Bryantii* S. and G. sp. nov.
 Series II. Acanthocarpicæ
 Tribe II. Glomerulatæ
 ** Rhachides terete
 ♂ Cryptostomata conspicuous.
6. *S. horridum* S. and G. sp. nov.
7. *S. Marchantæ* S. and G. sp. nov.
 ♂♂ Cryptostomata of leaves either minute or none
8. *S. Liebmanni* J. Ag.
 Tribe III. Biserrulæ
 * Illicifolia. Leaves more or less oblique at base
 ♂ Leaves ecostate
9. *S. Agardhianum* J. Ag.
10. *S. insulare* S. and G. sp. nov.
 Series III. Malacocarpicæ
 Tribe VI. Racemosæ
 * Acinariæ
 ♂ Cryptostomata almost absent or none
11. *S. Brandegeei* S. and G. sp. nov.
 ♂♂ Cryptostomata more or less conspicuous
 ψψ Vesicles spherical
12. *S. sinicola* S. and G. sp. nov.
13. *S. polyacanthum* f. *americanum* S. and G. f. nov.
 ** Glandulariæ
 ♂ Vesicles elongated, aristate
14. *S. Johnstonii* S. and G. sp. nov.
15. *S. Johnstonii* f. *laxius* S. and G. f. nov.
16. *S. Johnstonii* f. *gracile* S. and G. f. nov.
 ♂♂ Vesicles spherical
17. *S. cylindrocarpum* S. and G. sp. nov.
 *** Siliquosæ
 ♂ Younger receptacles rather cymose, confluent
 with the fertile rhachis, etc.
18. *S. herporhizum* S. and G. sp. nov.
 ♂♂ Younger receptacles swollen on a rhachis, etc.
19. *S. paniculatum* J. Ag.

RHODOPHYCEÆFamily **BANGIACEÆ***ERYTHROTRICHIA* ARESCHOUG, Phyc. Scand., 1850, p. 209 (435 repr.)**Erythrotrichia polymorpha** Howe

We have noticed scattered specimens, on various hosts, of a small, epiphytic red alga forming disks similar to those figured by Howe (1914, p. 77, pl. 29) for *E. polymorpha*. In one instance, Johnston, no. 32a, on *Dictyota hesperia*, they are sufficiently abundant to give the surface of the host a reddish hue. In no instance have we been able to observe the erect filaments from the center of the disks as figured by Howe (*l. c.*, figs. 8, 11-14), but according to Howe's idea the species may even come to complete maturity and reproduce without the development of these erect parts. We are placing our specimen here provisionally, awaiting further knowledge of the life-history of the species.

Howe, Mar. Alg. Peru, 1914, p. 77.

GONIOTRICHUM KUETZING, Phyc. Gen., 1843, p. 244,
in *Linnaea*, vol. 17, p. 89

We are not sure as to which one of the above publications may claim the priority in the publication of this genus. In neither work is reference made to the other. In *Linnaea* the name is a *nomen nudum*. We are considering the appearance in *Phycologia Generalis* as constituting the original publication.

Goniotrichum Alsidii (Zanard.) Howe

Growing sparsely on various species of algae. Seemingly particularly characteristic in Johnson, no. 167.

Howe, Mar. Alg. Peru, 1914, pp. 75, 76.

For a discussion of the literature and the reasons for the use of the above combination, see Howe (*loc. cit.*) whom we are following in placing this somewhat troublesome alga, troublesome as to its genetic relationship.

Family GELIDIACEÆ

SCINAIA BIVONA-BARNARDI, *Scinaia*, etc., in L'Iride, 1822

For a discussion of the genus see Setchell, *The Scinaia* Assemb., 1914, p. 79 *et seq.*

***Scinaia latifrons* Howe**

Cast ashore at Guaymas, Mexico, Marchant, nos. 53 and 57. Howe, Phyc. studies V, 1911, p. 500; Setchell, *loc. cit.*

Several excellent specimens of this elegant species of *Scinaia* were taken at Guaymas. The only other known locality in the Gulf of California from which it has been reported is the type locality, La Paz.

***Scinaia Johnstonæ* Setchell**

Dredged in 4-9 fathoms, Los Angeles Bay, Lower California. Johnston, no. 46. San Pedro Martir Island, Johnston, no. 106. Esteban Island, Johnston, no. 114.

Setchell, *The Scinaia* Assemb., 1914, p. 97.

The specimens here cited resemble very closely the type of the species as found at San Pedro, California, the type locality.

GELIDIUM LAMOUROUX, *Essai*, 1813, p. 41 (40 repr.)

***Gelidium Johnstonii* S. and G. sp. nov.**

Plates 72, 73 and 46, a

Fronds flattened throughout, 7-12 cm. high, central axis up to 3 mm. wide, tapering abruptly at the base, and gradually upwards, dividing irregularly and more or less pinnately above into several segments, which in turn are 3-4 times regularly and pinnately divided; the ultimate, tetrasporic ramuli decidedly flattened; the ultimate, cystocarpic ramuli subcylindrical, cystocarps above the center; medulla composed of sparse cells and a few small scattered fibers, inner cortex of larger cells and abundant fibers, outer cortex of anticlinal rows of 3-4 cells.

Growing on rocks in the upper sublittoral belt. San Marcos Island, Gulf of California, Johnston, no. 13, June; San Francisco Bay, Lower California, Johnston, no. 27, June.

Type: No. 1343, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 27), in June, at **San Francisquito Bay, Lower California.**

Gelidium Johnstonii seems to be most closely related to *Fucus Amansii* Lamour. (Diss., 1805, p. 48, pl. 26, figs. 2-5) or *Gelidium Amansii* Lamour. (in Kuetzing, Tab. Phyc., vol. 18, 1868, p. 16, pl. 44). The original description and the figure represent a plant cylindrical throughout, with subdichotomous branching and acute ultimate ramuli. Our plant differs from this in being decidedly flattened throughout, and the branching is regularly pinnate. *G. Johnstonii* also resembles *G. Amansii* Okamura (Icon. Jap. Alg., vol. 3, 1913, p. 25, pl. 106). The tetrasporic ramuli in ours are more flattened and spatulate. Okamura does not figure nor describe the structure of the frond. We are thus in considerable doubt as to whether the two collections are identical, and incline to the belief that ours is an entirely distinct and undescribed species.

***Gelidium decompositum* S. and G. sp. nov.**

Plate 71

Fronds flattened throughout, 6-9 cm. high, central axis up to 1.5 mm. wide, dividing irregularly into 4-7 primary branches, these in turn are densely 4-5 pinnately branched, pinnæ of each different order variable in length, nearly perpendicular to the axis of origin, many recurved, those of the third and fourth order often densely matted together; fibers absent in terminal and subterminal ramuli, scattered along the edges of the medulla of medium ramuli, scattered through the medulla in primary axes; cortex of a single row of palisade cells, subcortex of larger thick-walled cells; fruiting conditions unknown.

Growing on rocks in the lower littoral belt.

Type: No. 1344, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 23), in June, at **San Francisquito Bay, Lower California.**

Gelidium decompositum differs chiefly from *G. Johnstonii*, with which it seems somewhat closely related, in the greater irregularity of the length of the pinnæ which are mostly very decidedly crowded together and stand more nearly perpendi-

cular to the parts from which they arise, and in being smaller in all of their dimensions. The sub-cortex, and especially the cells of the medulla are decidedly larger and thicker walled.

Family GIGARTINACEÆ

GIGARTINA STACKHOUSE, Mém. soc. nat. Mosc., II, 1809

Gigartina Chauvini (Bory) Mont.

Plate 46b and plate 70

Growing on rocks. San Esteban Island, Gulf of California, Johnston, no. 53, April; Georges Island, Gulf of California, Johnston, no. 101, April.

Montagne, Voyage Bonite, p. 72. *Sphaerococcus Chauvini* Bory, Voyage Coquille, no. 58, p. 165, pl. 26. *Chondroclonium Chauvini* Kuetzing, Tab. Phyc., vol. 17, 1867, pl. 70.

We have a series of plants listed under the above mentioned numbers which seem to be very close to the *Sphaerococcus Chauvini* of Bory, based upon the material collected by Lesson and Durville at Concepcion, Chile. Bory was confronted with the same difficulties, apparently, which have confronted us, viz. —a series of forms without any accompanying data as regards their habitat, variability, etc., and hence he finally grouped them under one species with three forms, α *latissimus*, β *intermedius* and γ *angustus*. Plate 70 may be taken as representing his widest form, and plate 46, figure b, as representing his narrowest form. Critical study of these various forms in their native habitat may reveal them to be distinct entities with wide, though limited, variations. For the present, with the scanty material at hand, we are grouping them all under one species.

Gigartina sp.

Johnston, no. 10a, represents a single small plant which seems to be unlike any known species. The specimen is sterile, and seems to be close to *G. tenella* Harvey. We are not venturing to name it.

GYMNOGONGRUS MARTIUS, Fl. Bras., I, 1833, p. 27

***Gymnogongrus carnosus* S. and G. sp. nov.**

Plate 47, a, and plate 22, fig. 1

Fronds 7-10 cm. high, attached by a small disk-shaped hold-fast, irregularly and subdichotomously branched, more or less flattened throughout, somewhat cartilaginous, gelatinizing readily in fresh water after drying; color purplish red; cystocarps relatively small, completely immersed in the tissues of the frond; tetraspores and antheridia unknown; medulla composed of large, rounded, thick-walled cells merging gradually into smaller subspherical cells of the subcortex, merging in turn into anticlinal rows of small, thick-walled cortical cells, 6-9 in a row.

Cast ashore.

Type: No. 1345, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 102), in April, at **San Pedro Martir Island, Gulf of California.**

The combination of characters of this species is not such as to make it unmistakably a member of the genus *Gymnogongrus*. It has a Gigartinaceous cystocarp, and the histological characters are mainly those of *Gymnogongrus*. The very gelatinous nature of the cell-walls, however, is quite different from those of all the known species of the genus.

DICRANEMA SONDER, Nova Algarum, 1845, p. 56

***Dicranema rosaliæ* S. and G. sp. nov.**

Plate 22, fig. 6

Fronds 2-4 cm. high, 350-450 μ diam., sparsely and irregularly branched, cylindrical, tapering upwards to acute apices; medulla composed of a small group of compact, thick-walled, elongated cells, surrounded by about two layers of large, rounded thick-walled cells, with a few small angular cells interspersed just beneath the single layer of cortical cells more or less cubical in form; reproduction unknown.

Cast ashore. Santa Rosalia, across the bay from Guaymas, Mexico. Type, Marchant, no. 103.

Unfortunately all of the specimens of this species are sterile. We are placing them under *Dicranema*, basing our judgment wholly upon the vegetative characters.

CALLOPHYLLIS KÜETZING, Phyc. Gen., 1843, p. 400, pl. 69, fig. 2
in *Linnaea*, vol. 17, 1843, p. 102 (*nom. nud.*)

Callophyllis Johnstonii S. and G. sp. nov.

Plate 51, a, b

Fronds 6-8 cm. high, 2-4 mm. wide, mostly tapering gradually upwards and more or less acute, consistency mucilaginous, color purplish, branching dichotomous to subdichotomous, angles relatively acute; medulla composed of thick-walled large cells, becoming smaller gradually outwards and interspersed with fine filaments; cortical cells small, easily separating into branched tufts; cystocarps scattered over the "disk" of the frond, numerous and prominent, often elongated lengthwise of the frond, with a single carpostome, not rostrate; antheridial plants thin and delicate; tetraspores unknown.

Growing on rocks in the upper sublittoral belt.

Type: No. 1346, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 118), in June, at **Tortuga Island, Gulf of California.**

We have but a few specimens of this genus which seems sufficiently amply distinct from all known species to warrant its publication. Some specimens have, in addition to the regular larger branches, rows of short, closely set fimbriæ which bear fruit.

CALLYMENIA AGARDH, J. G., Algæ Med., 1842, p. 98

The original spelling is *Kallymenia*. The genus was founded upon *Rhodomencia Requierii* J. Ag., Symb., 1841, p. 12.

Callymenia pertusa S. and G. sp. nov.

Plate 49, b

Fronds thin and flabby, indefinite in form and size, rose colored, perforations numerous, relatively large, nearly circular, smooth; medulla composed of much branched, intertwined

filaments passing rather abruptly on either side into a few relatively large angular cells in turn merging into short, 2-4 celled anticlinal rows, forming the cortex, the terminal cells in the rows being 4-6 μ diam., and 2-3 times as long; reproduction unknown.

Cast ashore.

Type: No. 1347, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 105), in April, at **San Pedro Martir Island, Gulf of California.**

Unfortunately the plants of this collection are too fragmentary and sterile to permit a complete diagnosis of the species. The habit is different from *C. perforata* J. Ag. and the perforations are different from those of *C. cribrosa* Harvey, while the structure is different from both.

Family RHODOPHYLLIDACEÆ

ANATHECA SCHMITZ, in Schmitz and Hauptfl., Rhodophyllidaceæ,
in Engler and Prantl, Natürl. Pflanzenfam., 1896, p. 374

Anatheca elongata S. and G. sp. nov.

Plate 22, figs. 4, 5 and plate 69

FronD 15-18 cm. high, 5-8 mm. wide, irregularly branching into several elongated erect segments, and into numerous, short, subulate, perpendicular marginal pinnæ; medulla composed of a few small compact filaments, merging directly into large, rounded thick-walled parenchymatous cells with abundant contents, these becoming smaller, somewhat elongated radially and terminating in 2-3 layers of small, angular cortical cells; tetrasporangia 70-80 μ long, tetraspores zonate, terminal ones more or less conical; cystocarps and antheridia unknown.

Cast ashore.

Type: No. 1348, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 107), in April, at **San Pedro Martir Island, Gulf of California.**

The structure of this species of *Anatheca* is very similar to that of *A. furcata* S. and G. (1903, p. 310, pls. 23, 24) from Whidbey Island, Washington, but the plants are very much

longer and narrower and the branching distinctly different. It is a much larger and coarser plant in every way than *A. dichotoma* Howe (1911, p. 502, pl. 29) from the Gulf of California.

EUCHEUMA AGARDH, J. G., *Nya Alg.*, 1847, p. 16

Eucheuma uncinatum S. and G. sp. nov.

Plates 67, 68

Fronds cylindrical, cartilaginous, 15-20 cm, up to 33 cm. high, 3-5 mm. diam., attached by a parenchymatous disk, branching freely into numerous long, slender, acute branches beginning near the base, all densely clothed with short, more or less branched, acute, uncinata, spinose, fructiferous ramuli; cystocarps occupying the base of the ramuli; antheridial and tetrasporic ramuli much more branched and uncinata than the cystocarpic; color purplish red.

Growing on rocks. San Francisquito Bay, Lower California, Johnston, no. 28, June; San Esteban Island, Gulf of California, Johnston, no. 54, April; Isla Partida, Gulf of California, Johnston, no. 80, July; Angel de la Guarda Island, Gulf of California, Johnston, no. 84a; North San Lorenzo Island, Gulf of California, Johnston, no. 86, June; San Esteban Island, Gulf of California, Johnston, no. 109, April; and Mazatlan, Mexico, Marchant, nos. 62 and 63, May.

Type: No. 1349, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 86), in May, at **North San Lorenzo Island, Gulf of California.**

The distinguishing characteristic of the species is the numerous branched, acute, uncinata ramuli. The ramuli are rarely branched, however, in the cystocarpic plants, which we have considered to belong to the species.

Eucheuma Johnstonii S. and G. sp. nov.

Plate 25, fig. 42 and plates 65, 66

Fronds cylindrical, cartilaginous, 40-50 cm. high, 3-6 mm. diam., gradually attenuated to acute apices; main frond extending nearly to the apex, profusely and alternately branched, branches of several orders, ultimate ramuli of short, acute

spines, irregularly placed; cystocarps unknown; tetrasporangia 80-100 μ long, 30-40 μ broad; tetraspores zonate, very unequal in size, the two terminal ones apparently abortive.

Growing on rocks.

Type: No. 1350, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (Nos. 84 and 88b, tetrasporic plants), in June and July, at **Angel de la Guarda Island, Gulf of California.**

The plants of this species are apparently the largest that have yet been reported. The largest specimen measured over fifty centimeters and was broken off at the base so that the full length could not be ascertained. The extreme inequality in size of the tetraspores, so far as we are aware, has not before been reported. From the relatively small size of the two terminal ones in the sporangium, it would seem that they must be sterile. They are represented on plate 25, figure 42.

GELIDIOPSIS SCHMITZ, Mar. Florid., 1895, vol. 21, p. 148

***Gelidiopsis tenuis* S. and G. sp. nov.**

Plate 22, fig. 2

Fronds 2-3 cm. high, 0.5-0.8 mm. diam., cylindrical, sparsely and alternately branched, long-attenuated, acute; reproduction unknown.

Cast ashore. Santa Rosalia, near Guaymas, Mexico. Type, Marchant, no. 104.

We have very little data upon which to base this species since all of the scanty material at our disposal is sterile. The structure of the fronds seems clearly that of a *Gelidiopsis*, and the size and method of branching seem to be distinct, differing sufficiently from all the few known species to warrant giving to it specific rank, awaiting further data with which to verify the conclusion. The medullary structure is denser than that of *G. variabilis* Harvey, from Ceylon.

GRACILARIA GREVILLE, Alg. Brit., 1830, p. 121

Gracilaria Vivesii Howe

Plate 64

Cast ashore. Guaymas, Mexico, Marchant, no. 55.

Howe, Phyc. Studies V, 1911, p. 503, pls. 30 and 33.

The type locality of *G. Vivesii* is La Paz, Lower California. Although we have fairly extensive collections by Johnston, Marchant and Brandegee from this locality, nothing among them seems to agree with Howe's description and figures of the species. The specimens which we have here allied with this species seem to agree perfectly so far as color, form and structure are concerned. The plant figured on plate 64 is considerably larger (about twenty-four centimeters high) than the measurements given by Howe for his La Paz plant, but this is the largest of several specimens in the collection, and has a few more dichotomies than the type. We have a single plant with young cystocarps, rather sparsely scattered over the frond. The other specimens are sterile. Howe had only sterile and antheridial plants.

Gracilaria lichenoides (L.) Harv.

Growing in the sublittoral belt. Coyote Bay, or Concepcion Bay, Lower California, Johnston, no. 14, June.

Harvey, Alg. Tasm., 1844, p. 445.

The plants of this collection are sterile. They have the habit of *Fucus lichenoides* of Turner (Fuci, vol. 2, 1809, pl. 118) although they resemble *G. confervoides* as figured by Harvey, in Phyc. Brit., vol. 1, 1846, pl. 65. There is a rather more abrupt transition to two layered cortex than in the plant figured by Kuetzing for *G. lichenoides* in Tab. Phyc., vol. 18, 1858, pl. 81, b, otherwise the structure is practically the same.

Gracilaria vivipara S. and G. sp. nov.

Plate 24, figs. 28, 29 and plate 63

Fronds flat, 15-20 cm. up to 30 cm. high, 1.5-2.5 cm. up to 4 cm. wide, branching sub-dichotomous to flabellate-polytomous, segments decidedly cuneate, apices rounded, more or

less rolled along the margin, with numerous proliferations of various shapes; main fronds up to 600 μ thick in the lower parts, terminal lobes much thinner; medulla composed of 4-5 more or less indefinite layers of thick-walled, subspherical cells, up to 400 μ diam., and with very sparse contents; the medulla merging rather abruptly into the subcortical tissue composed of a few rounded cells abundantly supplied with contents, and these merging into the cortex composed of 2-3 layers of cuboidal cells or at times slightly elongated radially; cuticle up to 10 μ thick; tetrasporangia numerous, distributed over the main parts of the fronds; cystocarps rather sparse, distributed over the frond; antheridia unknown; color dark violet purple.

Dredged from 4-6 fathoms. Smith Island, Gulf of California, Johnston, no. 61, June.

Type: No. 1351, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 36), in June, at **Los Angeles Bay, Lower California.**

This species of *Gracilaria* resembles in general form no other described species of the genus. It is much larger than *G. Cunninghamii* Farlow, much more proliferous and flabby than either *G. Vivesii* Howe or *G. peruana* Picc. and Grun., and is decidedly different from *G. Johnstonii* of this paper, although it seems to have its nearest relatives in these species.

***Gracilaria pinnata* S. and G. sp. nov.**

Plate 61

Fronds flattened, sub-cartilaginous, 8-10 cm. high, 3-4 mm. wide, pinnately branched, the branches and terminal pinules all tapering gradually to acuminate apices; marginal pinules either alternate or secund; medulla composed of elongated cells in transverse section, decreasing in size toward the margins; cortex composed of 2 layers of small cuboidal cells; reproduction unknown; color purplish red.

Dredged in 4-6 fathoms.

Type: No. 1352, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 44), in June, at **Los Angeles Bay, Lower California.**

The basal portions of all of the plants in this collection are lacking. The plants, however, have the appearance of being nearly complete. They are all sterile. The method of branching and flatness of fronds allies them with *J. G. Agardh's* subgenus *Podeum*, but it does not agree with any of the species described under this section of the genus.

Gracilaria sinicola S. and G. sp. nov.

Plate 62

Fronds dark flesh colored, decidedly coriaceous, 15-20 cm. up to 30 cm. high, 2-3 cm. wide, dichotomously branched 4-6 times, segments only slightly cuneate, margins smooth, entire or at times slightly proliferous; terminal segments blunt, rounded, angles rounded; medulla composed of large rounded cells, merging into a few small spherical subcortical cells; cortex composed of 4-6 layers of small cuboidal cells, the surface layer two times as long radially as broad; cuticle 8-10 μ thick; cystocarps and antheridia unknown; tetrasporangia abundant, spread over the whole surface of the upper parts of the frond.

Type: No. 1353, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 108), in April, at **San Esteban Island, Gulf of California.**

Gracilaria sinicola is closely related to *G. Vivesii* Howe but the fronds are more rigid and coriaceous, are darker colored, have more acute angles, longer segments and a thicker cortex.

Gracilaria Johnstonii S. and G. sp. nov.

Plate 22, figs. 11-14 and plate 60

Fronds coriaceous, flat, 12-18 cm. up to 28 cm. high, 1-1.5 cm. wide, branching mostly poly-chotomous, segments mostly narrowed below, margins smooth, free from proliferations, terminal segments blunt, round, angles mostly rounded, color purplish red; medulla composed of large thick-walled cells merging into smaller, more or less spherical storage cells; cortex composed of 3-5 layers of small cells; cuticle 8-10 μ thick;

tetrasporangia numerous, scattered over the upper parts of the whole frond; cystocarps numerous, large and prominent, somewhat flattened; antheridia unknown.

Growing on rocks in the upper sublittoral belt.

Type: No. 1354, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 62), in July, at Isla Partida, Gulf of California.

Gracilaria Johnstonii resembles in habit some of the wider forms of *G. multipartita* (Clem.) Harv. but the smallest specimens are larger than the widest of that species.

***Gracilaria pachydermatica* S. and G. sp. nov.**

Plate 24, figs. 30, 31

Fronds attached by a small disk, cylindrical to slightly flattened, caespitose, 3-5 cm. high, 1.5-2.5 mm. diam., branching dichotomous, angles acute, color coral red; medulla composed of cells relatively uniform in size, nearly circular in cross section, merging almost directly into the cortex composed of 2-3 layers of cells except towards the base where it becomes 10-20 cells thick, parenchymatous, arranged in radial rows; reproduction unknown.

Growing on rocks in the upper sublittoral belt.

Type: No. 1355, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 122), in June, at Tortuga Island, Gulf of California.

The habit of *Gracilaria pachydermatica* is close to the habit of *Sphaerococcus obtusus* Kuetzing, (Tab. Phyc., vol. 19, 1869, pl. 21) from Ceylon. The fronds are more regularly dichotomous, much more densely caespitose, and has the much thickened cortex on the stipe. Nothing is known of the reproduction in either species.

***Gracilaria crispata* S. and G. sp. nov.**

Plate 22, figs. 7-10 and plate 44, a

Fronds complanate throughout, 4-7 cm. high, 400-600 μ thick, attached by a very small disk; color dark purplish red; branching polytomous into several distinct main branches, each

again dividing into several smaller segments with crisped margins and finally terminating in very numerous fine flattened ramuli; fronds composed of 3-5 layers of medullary cells very variable in size, up to 200 μ diam. and subspherical, merging into 2-3 layers of smaller subcortical cells giving rise to anticlinal rows of 2-4 cells, the outer usually considerably elongated; cuticle 4-6 μ thick; tetrasporangia among the anticlinal cells, 40 μ long, 30 μ broad; antheridia arising from subcortical cells, borne in pockets irregular in shape and size surrounded by elongated cortical cells; mature cystocarps wholly superficial, scattered over the whole frond, mostly apiculate, placentæ narrow at base, extending upward and branching in all directions.

Cast ashore. Eureka, near La Paz, Lower California. Type, Marchant, no. 51, May.

Gracilaria crispata has very much the same habit as *G. Millardetii* (Mont.) J. Ag. in the section *Podium* of J. Agardh (Epicr., p. 422) but has apparently more of the structure of the members of his section, *Pachycladia*. Our plants are much smaller and much more profusely branched, especially so at the outer ends of the secondary branches. The placenta of the cystocarp has a structure worthy of note as being quite distinct from any which have been described in the genus. Contrary to the general rule, the base of the placenta is relatively small. The sterile, almost parenchymatous, mass of cell extends upward through the cavity of the cystocarp, branches in all directions, and finally terminates in simple spore bearing threads, giving rise to chains of carpospores.

The antheridia are similar to those described by Howe (Phyc. Studies, 1911, p. 503, pl. 33, figs. 1-5) in *G. Vivesii*, but the crypts are not so extensive as he illustrates for that species. The tetrasporangia are of the characteristic type, and occur in the narrow cortex of the anticlinal cells. The cortex in the cystocarpic plants is composed quite uniformly of two cells in the anticlinal rows except in the wall of the cystocarp which has several cells in a row. There is a much more abrupt change from the subcortical cells to the anticlinal cells than in either the tetrasporic or the antheridial plants. The

antheridial plants are more laciniately divided and are less crisped along the margins than either the tetrasporic or cystocarpic plants.

***Gracilaria subsecundata* S. and G. sp. nov.**

Plate 23, figs. 26, 27 and plate 59

Fronds subcylindrical, attached by a small disk, 10-14 cm. high, 1-2 mm. wide, branching variable, dichotomous, dichotomopalmate, distichous and secund, attenuated upwards and acute; medullary cells more or less angular, irregular in shape and size, merging into smaller parenchymatous cells radially elongated, these terminating in anticlinal rows 3-4 cells long; cystocarps and antheridia unknown; tetrasporangia of the usual *Gracilaria* type.

Cast ashore. Guaymas, Mexico. Type, Marchant, no. 56, May.

This species of *Gracilaria* is decidedly distinct from all of the others collected in the Gulf of California, and indeed seems to have no close relative outside of the Gulf. The relatively delicate acute fronds and the diversity of methods of branching are distinguishing characters.

***Gracilaria lacerata* S. and G. sp. nov.**

Plate 51, C

Fronde flattened, 6-8 cm. high, 2-5 cm. wide, color dark coral red, branching more or less irregular, margins somewhat proliferous, serrate, with scattered teeth, lenticular in cross section; medulla composed of thin-walled parenchymatous cells, surrounded by a few small angular cells, the whole clothed in a single layer of small, cuboidal cortical cells; cystocarps and antheridia unknown.

Cast ashore. Santa Rosalia, near Guaymas, Mexico. Type, Marchant, no. 102, May.

The plants of this species apparently have been subjected to abnormal treatment. They are covered with foreign material, and appear to be more or less battered. The tetrasporic plants have the characteristic tetraspores of the genus. It undoubtedly belongs to J. Agardh's section *Podeum*, and is possibly

near to *G. corticata* J. Ag. and to *G. dentata* J. Ag., but is more lacerate or dentate than the former, and broader, thinner and less acutely dentate than the latter.

Gracilaria sp.

Plate 58

We have a few sterile specimens, Johnston, no. 123, of a species which seems to belong to the genus *Gracilaria*, and is well illustrated as to size and method of branching on plate 58. The structure is somewhat different from typical *Gracilaria* and having no fruit we list it here under this genus without a name.

Gracilaria sp.

We have three fragments of plants under Marchant, no. 64, which have the general appearance of *Gracilaria confervoides* but whose structure is quite different from the structure of that species as represented by Thuret and Bornet in *Etudes Phycologiques*, plate 40. The fronds are cylindrical, slightly branched and long attenuate. The medullary cells are up to 300 μ in diameter and change rather abruptly into two or three layers of smaller cells and finally these into anticlinal rows of four to six cells.

It is possibly near to *Gracilaria dura* (Ag.) J. Ag., but is much less branched than that species. We list it here with the hope that better material may be found, when its correct classification may then be made out.

CORALLOPSIS GREVILLE, Alg. Brit, Syn., 1830, p. LIII

Corallopsis excavata S. and G. sp. nov.

Plate 23, figs. 24, 25 and plates 44, b, and 48

Fronds terete, caespitose, 8-14 cm. high, 1-2 mm. diam., attached at first by a small disk, later by branched, creeping filaments or fronds, giving rise to numerous erect fronds; branching on all sides, alternate or opposite, often becoming fasciculate at the top, at times producing whorls of short.

subulate ramuli mostly at the nodes; young plants and terminal ramuli of mature plants, particularly tetrasporic plants, deeply constricted at regular intervals forming fusiform segments, medulla composed of a loose network of fine filaments in the tetrasporic region, terminating toward the surface in anticlinal rows of cortical cells; in the vegetative region composed of narrow, parenchymatous cells elongated lengthwise of the filaments, merging into large cells, cells of the subcortex and terminating in short anticlinal rows of the cortex; color dark coral red; tetrasporangia numerous in cavities opening at several points in the fusiform segments, or internodes; tetraspores variable, mostly cruciate; cystocarps numerous, very prominent spherical to urn-shaped, placenta large, dense, much elevated, pericarp thick, composed of anticlinal rows of small dense cells, carpostome small, single, carpospores very numerous, 7-10 μ diam., in radiating rows from the large placenta; antheridia unknown.

Growing on rocks in the upper sublittoral belt. San Marcos Island, Johnston, no. 12, June; Tortuga Island, Johnston, no 21, June; Isla Partida, Johnston, no. 59, July; San Esteban Island, Johnston, no. 116, April; Angel de la Guarda Island, Johnston, nos. 129 and 130, June, all in the Gulf of California.

Type: No. 1356, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 59 with tetraspores, and No. 21 with cystocarps), in June and July, at **Tortuga Island and Isla Partida, Gulf of California.**

This interesting and apparently unique plant seems to be pretty generously distributed in the Gulf. We are in some doubt as to the genus to which it belongs. Judging from the description only, of the genus *Corallopsis* Grev., it seems best for the present to ally it with that genus. We have no specimens of any species of the genus for comparison. Indeed, most of the species have been imperfectly described. Its internal structure is differentiated into three tissues, whereas the description of the genus calls for only two. The structure of the cystocarp agrees very well with the generic description. Tetraspores have been described in only one species, viz.; *C. aculeata* (Her.) Holmes (New Mar. Alg., 1894, p. 336, pl. 18,

fig. 16-20). The tetraspores in this species are regularly cruciate, but are developed near the surface in the anticlinal rows. The tetraspores of ours are developed in cavities extending to the center of the swollen, almost moniliform, portions of the ramuli. The tetraspores escape through numerous openings on the surface (plate 23, fig 25). We know of no other plant which has tetraspores borne in this way. It may thus become necessary, after a careful study of the species, especially of the antheridial plants, to create a new genus for its reception.

HYPNEA LAMOUREUX, Essai, 1813, p. 43

Hypnea pannosa J. Ag.

A few scattered specimens of a *Hypnea* which seems to belong to this species have been found among the Johnston specimens.

J. G. Agardh, *Nya. Alg.*, 1847, p. 14.

Hypnea Johnstonii S. and G. sp. nov.

Plate 23, fig. 19-21 and plate 57

Fronds densely caespitose, 7-10 cm. high, 1.5-2.5 mm. diam. freely branching near the decumbent base into long, rigid, tapering branches, these in turn producing numerous, aculeate ramuli on all sides, gradually reduced in length towards the apices; apices rounded, not terminated by a single cell; tetrasporangia borne on very short, densely branched, acuminate, fructiferous ramuli not constricted at the base; tetraspores zonate; cystocarps and antheridia unknown; color dark red.

Growing on rocks in the upper sublittoral belt. Tortuga Island, Gulf of California, Johnston, no. 125, May; Angel de la Guarda Island, Gulf of California, Johnston, no. 1, June.

Type: No. 1357, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 1), in June, at Angel de la Guarda Island, Gulf of California.

Hypnea Marchantæ S. and G. sp. nov.

Plate 23, figs. 22, 23 and plates 42, a, and 56

Fronds cæspitose, 8-14 cm., up to 20 cm., high, up to 1 mm. diam., branching very irregular, of 5-8 orders, becoming smaller at each successive branching and more or less contorted, clothed throughout with short, relatively simple, perpendicular, sterile branches of varying lengths and in part with densely crowded, subulate, acute, more or less branched, fructiferous ramuli; tetrasporangia in swollen parts of the ramuli, usually some distance from the broad base; antheridia and cystocarps unknown; ramuli terminating in a single growing cell.

Cast ashore. Eureka, near La Paz, Lower California. Type, Marchant, no. 48, May.

This species is to be distinguished from *H. Johnstonii* in being much longer, more delicate, in having more orders of branching, more densely crowded, less branched and more attenuate fructiferous ramuli, and in having a single apical cell instead of a group.

CORDYLECLADIA J. G. AGARDH, Sp. Alg., vol. 2, 1852, p. 702

Cordylecladia lemanæformis (Bory) Howe

"Sublittoral, on sandy beach. Very common." Los Angeles Bay, Lower California, Johnston, no. 35, June; La Paz, Lower California, Johnston, no. 48, April, and Marchant, no. 69, May.

Howe, Mar. Alg. Peru, 1914, p. 128. *Gigartina lemanæformis* Bory, Voy. Coquille, Bot. Crypt., 1828, p. 151. *Cordylecladia Andersonii* Grun. (in part) in Piccone Alg. Vettor Pisani 1886, p. 62.

We have a series of fine specimens of plants which we are referring to this species. They very much resemble some forms of *Gracilaria confervoides*, but they are much more profusely branched, decidedly more delicate, longer attenuate upward and are acute. The medulla is composed of large parenchymatous cells, merging abruptly into a rather thick cortex, composed of very small cells. The cystocarps are external, quite

small, and somewhat flattened, with a broad flattened placenta. The color is light brown to almost black. The plant agrees fairly well with Bory's description (*loc. cit.*) and in part with that of Grunow (*loc. cit.*) who based his description of *C. Andersonii* in part upon plants collected by d'Urville at Paita, Peru, and in part upon plants collected by Anderson on the coast of California, but our knowledge of the species comes through the description and figure of Howe.

Family BONNEMAISONIACEÆ

ASPARAGOPSIS MONTAGNE, Phyt. Canar., 1840, p. XV

Asparagopsis Sanfordiana f. *amplissima* S. and G. f. nov.

Plate 22, fig. 3 and plate 41

Fronds up to 25 cm. high, several arising from creeping filaments attached to rocks at various points; primary branches very densely crowded, plumose, 3-5 cm. long, arising on all sides; antheridia in dense cylindrical clusters at the ends of the ramuli.

Cast ashore. Eureka, near La Paz, Lower California. Type, Marchant, no. 37.

This form differs from the species principally in being much more ample in all of the upper branching portions. Apparently the antheridia have not previously been seen. We are describing and figuring them here.

Family RHODOMELACEÆ

LAURENCIA LAMOUREUX, Essai, 1813, p. 42

Laurencia obtusiuscula S. and G. sp. nov.

Plate 23, fig. 17 and plate 55

Fronds 10-18 cm. high, terete; main axis mostly percurrent, 1-2 mm. diam.; secondary branches distant, alternately branched on all sides, all of the branches being long and slender and more or less crooked; color dark purple. The short lateral branches bearing the fructifications sub-verticillate; fructiferous ramuli several, frequently themselves branched, arising on all sides, forming conical shaped groups; cells of the

main axis 25-35 μ diam., 2.5-3.5 times as long, ellipsoidal; cells of the fructiferous ramuli equilateral or slightly wider than long; cystocarps lateral on the ramuli, occupying the position of ultimate ramuli, flaskshaped with short neck, sessile, 600-700 μ diam.; tetrasporic ramuli cylindrical, up to 500 μ diam., blunt, scarcely constricted at the base; antheridia unknown.

Cast ashore. Eureka, near La Paz, Lower California, Marchant, nos. 40 and 46; La Paz, Lower California, Marchant, no. 67. Type, Marchant, no. 46, May.

Laurencia obtusiuscula seems, from its structure and general habit of growth, to be related rather closely to *L. papillosa* (Forsk.) Grev. but it differs very decidedly from that species as represented by Kuetzing (Tab. Phyc., vol. 15, pl. 62, a, b) in the character of the fructiferous ramuli. Those of *L. obtusiuscula* are cylindrical while those of *L. papillosa* are very short and broadly clavate, the younger ones subspherical. It seems best to coincide with the characters set forth by J. Agardh (Epicr., 1876, p. 653) for his group "Obtusæ," and is probably close to *L. obtusa* (Huds.) Lamour. or some described form.

***Laurencia obtusiuscula* var. *corymbifera* S. and G. var. nov.**

Plate 23, figs. 15, 16 and plate 45, b

Fronds 4-7 mm. high, branching at the base into several main branches, ramuli sub-verticillate, the ultimate fructiferous ramuli crowded on short branches forming dense clusters; cystocarps and antheridia unknown; tetrasporic ramuli cylindrical, slightly constricted at the base.

Growing on rocks in the upper sublittoral belt.

Type: No. 1358, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 18b), in June, at **Tortuga Island, Gulf of California.**

A few specimens of this plant were separated from a collection from Tortuga Island which resemble those which we have called *L. obtusiuscula*. They differ decidedly in general aspects as comparison of the figures of the two, as here produced, readily show. The plants of var. *corymbifera* are much smaller,

however we are unable to state whether these are typical specimens or otherwise. The tetrasporic plants are all which we have for study and these bear a close resemblance to *L. corymbifera* Kuetz. (Tab. Phyc., vol. 15, pl. 56, a, b) the tetrasporic ramuli are more numerous, however, and are not disposed in quite the same manner, and are more nearly cylindrical. If further discoveries should reveal these to be typical plants, the variety should doubtless be given specific rank.

***Laurencia obtusiuscula* var. *laxa* S. and G. var. nov.**

Plate 29, fig. 67 and plate 52, b

Fronds 5-8 cm. high, up to 1 mm. diam., branching into several main branches, ramuli less numerous and more scattered than in the species; cystocarps and antheridia unknown.

Cast ashore. Guaymas, Mexico. Type, Marchant, no. 41, May.

We have but a few tetrasporic specimens of this plant upon which to base our judgment. They are very much smaller in general stature and much less profusely branched than *L. obtusiuscula*. The characters of the cells and of the tetrasporic ramuli agree very well with *L. obtusiuscula*. Further investigation to determine the typical size, and the discovery of cystocarpic and antheridial plants may reveal characters sufficiently different to warrant specific rank for it.

***Laurencia paniculata* (Ag.) J. Ag. f.**

Growing on rocks in the lower littoral belt. San Francisco Bay, Lower California, Johnston, no. 30b, June; Isla Partida, Gulf of California, Johnston, no. 69, June.

The plants of these collections agree fairly well with the descriptions of *L. paniculata* J. Ag. (not *L. paniculata* Kuetz.) and with Kuetzing's figure of *L. glandulifera* (Tab. Phyc., vol. 15, pl. 59, fig. c). Howe (Phyc. Studies V, p. 508) listed a plant of the Vives collection under *L. paniculata* from La Paz, Lower California. The plants of the Johnston collection are probably of the same species. Howe states that the Vives' plants are more slender and the ultimate branches more elongate than the specimens under that name distributed from

Southern California in *Phycotheca Boreali-Americana*, no. 1093. Our plants are likewise more slender and smaller and not so regularly branched as are the California specimens. We have not had any authentic specimens of *L. paniculata* J. Ag. for comparison, but judging from the descriptions alone, we feel that our plants are not identical with Agardh's. The surface cells throughout the whole length of the main axis are of about the same dimensions, approximately $20\ \mu$ across, and occasionally slightly longer than broad. The semiwhorled arrangement of the ultimate ramuli are the same in the Johnston plants as is figured by Kuetzing for *L. glandulifera*. More critical study will be required to establish definitely the specific rank of these forms.

Laurencia estebaniana S. and G. sp. nov.

Plate 24, fig. 34 and plate 45, a

Fronds more or less compressed, 7-10 cm. high, 2-4 mm. broad, considerably distorted; main stem somewhat percurrent with branches at times nearly as long, branching pinnate to alternate, subdistichous, with branches more or less decurrent, fructiferous ramuli in dense glomerules on short ramuli, the glomerules at times distichous and sub-opposite, at times alternate or more or less verticillate; the antheridial ramuli numerous, short-turbinate; tetrasporic and cystocarpic ramuli nearly cylindrical; surface cells on the main frond $10-14\ \mu$ diam., 1.5-2 times as long as broad, on the fructiferous ramuli length less than the diameter; antheridia in dense, much branched pyramidal clusters, the apical cell of each main cluster pedicellate, sub-spherical, $20-25\ \mu$ long, $16-20\ \mu$ broad; antheridia 2-3 μ diam.

Growing on rocks at San Esteban Island, no. 53c, in April and Smith Island, no. 89, in June.

Type: No. 1359, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 53c), in April, at **San Esteban Island, Gulf of California.**

Laurencia estebaniana seems to have no close relatives on the Pacific Coast. It clearly belongs to Group IV, Pinnatifidæ, of J. Agardh (*Epicr.*, 1876, p. 655) in which he groups all of

the species with flattened or partially flattened fronds. Most of the fronds of *L. estebaniana* are decidedly flattened, but some of them are more or less terete above, and somewhat angled where the branches are decurrent. It is apparently most closely related to *L. flexuosa* Kuetz. but the tetrasporic ramuli are not arranged in whorls as represented by Kuetzing (Tab. Phyc., vol. 15, pl. 68) for that species.

Laurencia Johnstonii S. and G. sp. nov.

Plates 52, a, and 53

Frond up to 15 cm. high, cylindrical, slender throughout, attached by repeatedly branched rhizoidal filaments; primary axis percurrent, up to 1.5 mm. diam.; virgate, the secondary branches at times as long as the primary axis and clothed with very numerous, densely crowded, tertiary branches and ultimate fructiferous ramuli; color dark purple, black on drying; cells of the main axis equilateral to slightly longer than broad, with rounded angles; cells of the fructiferous ramuli slightly broader than long; fructiferous ramuli cylindrical, considerably constricted at the base, 375-425 μ diam., numerous, arising on all sides, of very numerous, short sub-ultimate ramuli, flask-shaped; antheridia unknown; terminal hairs in dense clusters, profusely branched, up to 130 μ long.

Growing on rocks in the upper sublittoral belt. San Marcos Island, Gulf of California, Johnston, no. 127, June; San Francisco Bay, Lower California, Johnston, No. 30a, June.

Type: No. 1360, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 127), in June, at San Marcos Island, Gulf of California.

Laurencia sinicola S. and G. sp. nov.

Plate 29, figs. 65, 66 and plate 50, a

Frond epiphytic, attached by a creeping thallus, decidedly compressed, 3-6 cm. long, 2-4 mm. broad, sparsely and pinnately branched, with branches at times as long as the main frond; surface cells of the main axis more or less ellipsoidal, 45-55 μ long 25-30 μ broad; fructiferous ramuli pinnately ar-

ranged, not constricted at the base, the antheridial tuberculate, the tetrasporic clavate-tuberculate, surface cells on the main frond 10-14 μ diam., 3-5 times as long; antheridia in loose paniculate clusters, the apical cell of each main cluster being pyriform, 7-9 μ long, 5-7 μ broad.

Growing on *Sargassum* sp. Eureka, near La Paz, Lower California, Marchant, nos. 34 and 47, May; San Marcos Island, Gulf of California, Johnston, no. 126, June. Type, Marchant, no. 47.

Laurencia sinicola is distinct in its gross morphological characters from all of the known species of *Laurencia* in the small size combined with the flattened frond. Its antheridial clusters are loose and composed of very delicate branches. The antheridia are small, 2-3 μ in diameter. It seems to be nearly related to *L. spectabilis* Post. and Rupr. but is very much smaller in all of its parts, less regularly pinnately branched and is epiphytic instead of growing on rocks.

Laurencia papillosa var. *pacifica* S. and G. var. nov.

Plate 23, fig. 18; plate 24, fig. 33; plate 43, a, b, and plate 54

Fronds pyramidal, 9-13 cm. high, main axis percurrent; fructiferous ramuli short, turbinate; antheridial and tetrasporic ramuli with several lobes around the terminal depression; antheridia borne in whorls on an axis terminated by a single large pyriform cell; color dark purple, almost black on drying; cystocarps not observed; cells on the surface of the main axis polygonal, closely appressed, thin, firm walled, 18-22 μ diam.

Growing on rocks in the upper sublittoral belt. San Marcos Island, Gulf of California, Johnston, no. 9, June; Eureka, near La Paz, Lower California, Marchant, no. 38, May. Type, Marchant, no. 38.

We have examined some of the co-type material of *L. papillosa* (Forsk.) Grev. and find that the ultimate fructiferous ramuli are sub-spherical, in this respect agreeing very well with the figures of Kuetzing in Tab. Phyc., vol. 15, pl. 62, figs. a, b. Our plants agree very well in general form and method of branching with the descriptions of *L. papillosa* but the fructif-

erous ramuli in ours are much less numerous and not so densely crowded, are short and much more broadly turbinate than in the co-type material or as shown in Kuetzing's figures.

Comparison with Howe's plant, no. 128, of *L. papillosa* from the Bahamas, shows a considerable difference in the character and size of the surface cells. Ours are about 20 μ in diameter, are thin walled and are densely crowded together, while his are about 40 μ in diameter and are somewhat thicker walled. The antheridial and tetrasporic ramuli of var. *pacifica* are broadly turbinate with several distinct lobes surrounding the terminal depression.

Laurencia sp.

Plate 29, figs. 68, 69

Among the specimens of the Marchant collection a terminal fragment of a branch from a tetrasporic plant was found (Marchant no. 76) which approximates to the description of *L. virgata* (Ag.) J. Ag. The tetrasporic ramuli are about 5 mm. long, and occur in very dense clusters alternately arranged on the stem so that the main stem is almost obscured. These ramuli are cylindrical and about a half millimeter in diameter. It is distinct from any of the other Mexican species but too fragmentary to justify a name.

CHONDRIA AGARDH, Syn. Alg. Scand., 1817, p. XVIII

Chondria acrorhizophora S. and G. sp. nov.

Plate 40, b

Fronds 4-5 cm. high, 500-700 μ diam., decompositely branched from near the base; main frond at times percurrent, more frequently divided into several secondary branches, the lower branches longest, forming a flat top, more or less resembling an inverted cone; the ultimate, tetrasporic ramuli numerous on all of the branches of different orders, 1-1.5 mm. long, standing at about 45° angle, constricted at the base, curved at times almost cirrhose at the apices; apices of the main branches nude for some distance, acute, usually uncinata; the subterminal ramuli frequently developing dense clusters of rhizoidal cells;

pericentral cells 5, large, surrounded by one layer of smaller, thick walled, angular cells, and the cortex composed of a single layer of cells; cortical cells thick walled, irregular in shape, 2-6 times as long as broad in surface view, decidedly elongated radially in cross section; pericentral cells of the lower parts of the main fronds having parts of the walls very much thickened.

Cast ashore. Eureka, near La Paz, Lower California. Type, Marchant, no. 44, May.

Chondria acrorhizophora resembles in form and size *C. lanceolata* Harv. but our specimens are terete throughout while *C. lanceolata*, as figured by Harvey in Phyc. Austral., plate 239, is flattened. A nearer relative, as it seems to us, may be found in *C. tenuissima* f. *californica* Collins, in Phy. Bor. Amer. (Exsicc.) no. 636, from La Jolla, Calif. These plants are more robust than ours and have a distinctly different cell structure.

POLYSIPHONIA GREVILLE, Fl. Edin., 1824, p. 308

Polysiphonia Johnstonii S. and G. sp. nov.

Fronds ecorticate, relatively rigid, 5-8 cm. high, up to 1 mm. diam. at the base, tapering gradually from the base upwards, branched dendritically near the base into several primary branches moderately wide-spreading, which in turn are repeatedly branched alternately and terminated by dense fascicles of fructiferous ramuli which finally terminate in dense fascicles of long branched hairs; pericentral cells 6, up to 1 mm. long at the base of the fronds, reduced in length above becoming quadrate or less in the ramuli; color dark brownish red, almost black on drying; cystocarps supported on short pedicels, numerous on the terminal ramuli, sub-spherical 450-500 μ diam., clothed with large quadrate cells 60-70 μ diam., antheridia in terminal, pyramidal, dark colored clusters. Tetrasporangia unknown.

Growing on *Gracilaria* sp.

Type: No. 1361, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 110), in April, at San Esteban Island, Gulf of California.

There are no *Polysiphonias* with six pericentral cells which at all approximate to the characters of this Mexican form.

Our plant varies in almost every detail from any of the described species. In some respects it may perhaps be considered close to *P. decipiens* Mont., which has seven pericentral cells, but differs in other respects. As figured by Kuetzing, Tab. Phyc., vol. 13, pl. 65, figs. c-e, the growing apices of *P. decipiens* are much more blunt and lack the fine terminal divisions and fascicles of hairs so characteristic in ours.

Polysiphonia Marchantæ S. and G. sp. nov.

Plate 49, a

Fronds 5-8 cm. high, 450-550 μ diam. at the base, ecorticated, main branching sub-dichotomous, ramuli alternate, distant, divaricate, terminating in a fascicle of long branched hairs; color dark red; pericentral cell 5; 3-4 times as long as broad below, 0.5-1 times above; cystocarps on short pedicels, slightly beaked, 380-420 μ diam.; tetrasporic ramuli relatively short and considerably distorted; tetrasporangia few, near the ends of the ramuli, spherical, prominent, 80-110 μ diam.

Cast ashore at Guaymas, Marchant, no. 50; Eureka, near La Paz, Lower California, Marchant, nos. 52, 83, and 84; La Paz, Marchant, no. 66 and Brandegee, no. 12. Type, Marchant, no. 66. The Marchant plants were all collected in May, 1917.

This five-siphoned species seems to be quite generally distributed in the Gulf of California. Having been cast ashore among other algæ, the habitat and the character of the attaching parts will have to remain subjects for future investigation.

The very large and relatively short cells and the size and general appearance of the plant are characters very similar to those of *P. Johnstonii* of this paper. There is a constant difference in the number of pericentral cells, and differences in details of dimensions of parts which, along with differences in the character and method of branching, render the two distinct species.

Polysiphonia forcipata Harvey (Mar. Bot. of West Australia) seems to be a near relative of *P. Marchantæ*, as far as we may judge from the description. The figures of Kuetzing

in Tab. Phyc., vol. XIV, pl. 44, figs. a-d, represent a plant of *P. forcipata* much more blunt, lacking the numerous small terminal divisions and fascicles of branched hairs which are prominent in ours. *P. forfex* Harvey, Phyc. Austr., pl. 96, considered by De Toni, Syll. Alg., vol. IV, p. 921, as a synonym of *P. forcipata*, has six pericentral cells and the forcipate ramuli much more blunt than ours.

***Polysiphonia sinicola* S. and G. sp. nov.**

Fronds ecorticate, 7-10 cm. high, 250-350 μ diam. at the base, tapering only in the upper parts, branching alternate on all sides; ramuli strict, substance soft and flabby, color flesh red, pericentral cells 6; reproduction unknown.

Growing on rocks in the lower littoral belt.

Type: No. 1362, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 41), in June, at Los Angeles Bay, Lower California.

It may seem presumptuous to describe another *Polysiphonia* from the small amount of material at our disposal and particularly so when the same is completely sterile. The six siphoned species appear to be rather scarce and the morphological characters of this one seem sufficiently different from any known form to warrant giving this one a name, awaiting further investigation to establish its independence.

DIGENEÆ AGARDH, Sp. Alg., vol. 1, part 2, 1822, p. 388

***Digenea simplex* (Wulf.) Ag.**

Cast ashore. La Paz, Lower California, Brandegee, no. 33.

Agardh, Sp. Alg., vol. 1, part 2, p. 389. *Conferva simplex* Wulfen, Crypt. Aquat., 1803, p. 17, n. 16.

The specimens of this collection are all sterile. Structurally they appear to be very similar to the specimens distributed in Collins, Holden and Setchell, Phyc. Bor. Amer., nos. 143 from Florida and 1939 from Bermuda.

HETEROSIPHONIA MONTAGNE, Prod. Phyc. Pol. Antarct., 1842, p. 4

***Heterosiphonia sinicola* S. and G. sp. nov.**

Plate 28, figs. 59, 60 and plate 47, b

Fronds erect, 6-8 cm. high, terete; main frond usually percurrent, dendroidally branched, up to 1 mm. diam.; branches terminated by small dense fascicles of much branched acute filaments with cells about twice as long as broad; medulla with 5 large pericentral cells surrounded by a single layer of smaller irregular cells; cortex composed of a single layer of cells, very thick-walled and very irregular in size and form, 2-5 times as long as broad, thicker radially in cross section; cystocarps and antheridia unknown.

Cast ashore. Eureka, near La Paz, Lower California, Marchant, no. 49, May; La Paz, Marchant, no. 65, May; Marchant, no. 86a. Type, Marchant no. 65.

The nearest described relative of this species seems to be *H. coccinea* (Huds.) Falkenb.

COLACODASYA SCHMITZ, in Engler and Prantl., Natürl. Pflanzenfam., 1897, p. 473

***Colacodasya sinicola* S. and G. sp. nov.**

Plate 28, fig. 63

Fronds very variable in size, up to 900 μ diam., solid, somatic portion spherical, attached by a broad base; cystocarpic fronds with ample somatic portion, covered with sessile or short stalked cystocarps; cystocarps spherical to slightly elongated, 160-180 μ diam.; antheridial fronds with smaller somatic portion giving rise to numerous antheridial branches, 400-500 μ long and sympodially branched; antheridia in dense fusiform clusters; tetrasporic fronds producing sparse short stichidial branches with short, slightly curved tips and tripartite tetraspores.

Growing on *Chondria acrorhizophora* S. and G. Eureka, near La Paz, Lower California. Type, Marchant, no. 43a, May.

Colacodasya sinicola is closely related to *C. verruciformis* Setchell and McFadden, in McFadden, 1911, p. 149, pl. 19,

growing on *Mychodea episcopalis* J. Ag. The material at hand, although having representatives of all three forms of fruit, is too sparse to admit of detailed study as to histological characters. The plants in general are smaller, the cystocarps are mostly sessile and more nearly spherical, not urceolate, and the tetrasporic ramuli, stichidia, are smaller, so far as the material at hand shows. These differences, coupled with having a different host and growing in a different temperature-region, seem to us sufficient to warrant keeping it separate for the present.

Family CERAMIACEÆ

CALLITHAMNION LYNGBYE, Hydr. Dan., 1819, p. 123

Callithamnion endovagum S. and G. sp. nov.

Plate 28, fig. 62

Plants parasitic (?), the endophytic portion extending completely through the frond of host, and composed of much branched, slender filaments, 5-7 μ diam., with cells very variable in length, giving rise to erect vegetative and reproductive filaments on both sides of the host; erect fronds blunt, up to 200 μ high, 8-10 μ diam., 2-5 times forked; cystocarps small, apparently with but a single lobe; tetrasporic and antheridial plants unknown.

Growing in the fronds of *Grateloupia prolongata* J. Ag.

Type: No. 1363, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 53b), in April, at San Esteban Island, Gulf of California.

Only cystocarpic plants of this species have been observed, and these are young. There are but two cells in the carpogonal branch and the carpogonium surmounting these is about 50 μ long. There are no known species closely related to it.

CERAMIUM AGARDH, Syn. Alg. Scand., 1817, pp. XXVI and 60

The genus *Ceramium* seems to be well represented in the Gulf of California, but, as is usual in the warmer waters, most of the species are very diminutive, indeed some are microscopic, and their discovery has been more or less accidental or inci-

dental in the study of the structure of their hosts, as has been our experience on several occasions. The amount of material has thus, in several instances, been very scanty and further study is highly desirable to clear up doubtful points and make known their complete history.

Ceramium procumbens S. and G. sp. nov.

Plate 27, figs. 51-54

Fronds microscopic, wholly prostrate, attached to the host by very short rhizoidal filaments, 0.5-1 mm. long, 45-55 μ diam., corticated only at the nodes, branching distichous, the ramuli parallel with the host, often opposite; tetrasporic ramuli short, clavate; tetrasporangia completely immersed, sparse, irregularly placed, 50 μ long, 40 μ broad; cystocarps single, or rarely 2-3 together, short-pedicellate, spherical, 50-60 μ diam., arising near the ends of ramuli, the main ramulus being pushed aside, 1-3 very short ramuli developing up around them; cystocarps few, 8-12, 20-25 μ diam.; antheridia on short specialized ramuli.

Growing on *Gelidium* sp., San Francisquito Bay, Lower California, Johnston, no. 27a, June, and on *Grateloupia proloungata*, Isla Partida, Gulf of California.

Type: No. 1364, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 27a), in July, at Isla Partida, Gulf of California.

The cystocarps are borne on short one-celled pedicels, and are most frequently single, but as many as three have been observed developing from the same node. The node becomes considerably enlarged, the main ramulus is turned to one side and a few very short ramuli arise from the node and develop around the cystocarp which appears now to sit upon the end of the frond.

This species seems very closely related to *Hormoceras pygmaeum* Kuetzing (Tab. Phyc., vol. 12, pl. 75, figs. a-c) as regards branching and general structure. The magnification as given by Kuetzing (*loc. cit.*) makes our plant somewhat

smaller. Kuetzing's plant seems less frequently branched and has no opposite branching, a character very prominent in ours. His plant apparently is erect, while ours is wholly prostrate.

***Ceramium bicorne* S. and G. sp. nov.**

Plate 28, fig. 64 and plate 74

Fronds 5-8 mm. high, profusely and dichotomously branched, attached by a creeping, prostrate portion with rhizoids; main fronds up to 200 μ diam., completely corticated above, the internodes naked below but shorter than the corticated zones at the nodes; corticating cells not arranged in longitudinal rows, rounded to slightly angular; tetrasporangia completely immersed, irregularly placed in the much swollen terminal ramuli; antheridia on ramuli similar to the tetrasporic ramuli; cystocarps sessile, usually double, surrounded by 6-8 ramuli, some or all of which may develop farther and produce other cystocarps; carpospores numerous, irregular in form, up to 60 μ long.

Growing on *Gratcloupia* sp., upper sublittoral belt.

Type: No. 1365, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 62a), in July, at Isla Partida, Gulf of California.

The combination of creeping habit with erect fronds, the small size, dense dichotomous branching, almost complete cortication, immersed scattered tetrasporangia and the final development of two sharp points after the last division of the apical cell on the forcipate branches, distinguish this species from all other known species. The sharp points found on this species are not unique, as they are present in other species, notably *C. Johnstonii* of this paper.

***Ceramium sinicola* S. and G. sp. nov.**

Plate 25, figs. 40, 41 and plate 75

Fronds 1-2 cm. high, dichotomously branched, the forcipate apices long and blunt, completely corticated above, internodes below partially naked; corticating cells not arranged in any definite order, 8-11 μ diam. in surface view, 3-5 sided, with

rounded angles; tetrasporangia completely immersed, in a single whorl at the nodes, occupying several forks of the terminal ramuli; cystocarps and antheridia unknown.

Found unattached among the fronds of *Laurencia* sp.

Type: No. 1366, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 67b), in April, at **Ensenada Bay, Lower California.**

The basal portions of this species of *Ceramium* were not present, thus leaving some doubt as to the size of the plant. The largest filaments below the tetrasporic ramuli are $140\ \mu$ in diameter, and it seems quite probable that the portion of the frond below this is not much larger.

Ceramium Johnstonii S. and G. sp. nov.

Plates 76, 77

Fronds up to 3 cm. high, and $80\ \mu$ diam., dichotomously branched, producing below numerous, lateral, secondary branches simple or dichotomously branched, completely and densely corticated, but the corticating cells of the upper branches slightly separating at the center of the internodes, forming a very narrow clear ring; corticating cells not arranged in rows, much rounded, $7-10\ \mu$ diam.; at maturity the apical cells become very acute; tetrasporangia completely immersed, scattered irregularly in the main fronds and more or less regularly in 2-3 whorls in the small lateral ramuli; cystocarps and antheridia unknown.

Found floating among other algæ. San Pedro Martir Island, Gulf of California, Johnston, no. 104, April; San Esteban Island, Gulf of California, Johnston, No. 111, April.

Type: No. 1367, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 104), in April, at **San Pedro Martir Island, Gulf of California.**

The distinguishing characters of this species are the development of the tetrasporangia immersed in the dense cortex of the main fronds and in the short-lateral ramuli towards the base; and the slight separation of the corticating cells forming a narrow clear area or ring at the internodes in the ramuli and

upper branches. The height and general size of the plants can not be definitely stated, as we have but a few fragments to judge from. From the general appearance of the lower parts of these, it seems that the species is rather diminutive.

***Ceramium serpens* S. and G. sp. nov.**

Plate 27, fig. 58

Thallus microscopic, creeping on the host and attached by short rhizoids, arising singly at a node, only sparsely forking, giving rise to a few sparsely branched, erect, fructiferous ramuli; mature creeping filaments 30-40 μ diam., at the nodes, corticated only at the nodes, the internodes naked and equal to, or up to, 4 times as long as the nodes; tetrasporangia usually single at the nodes, spherical, 20-25 μ , up to 40 μ , diam., extruding through the cortex; cystocarps and antheridia unknown.

Growing on *Laurencia* sp. La Paz, Lower California. Type, Marchant, no. 67c, May.

This is a very delicate and inconspicuous species, and although the material at hand is very scanty and only tetrasporic plants having been observed, the character of these having the tetrasporangia extruded and borne singly at the nodes, makes it entirely distinct from any known species. Its nearest relative, among the known Mexican forms, is *C. procumbens* of this paper, from which, however, it may be readily recognized by the tetrasporic characters.

***Ceramium interruptum* S. and G. sp. nov.**

Plate 26, fig. 47

Fronds 8-12 mm. high, 180-250 μ diam. towards the base, enlarged above, branching regularly dichotomous, densely corticated above, except the first internode just above the forkings, corticated only at the nodes below; tetrasporangial branches up to 500 μ diam., decidedly torulose, tetrasporangia imbedded beneath the cortex, disposed more or less irregularly in 2-3 whorls, slightly ellipsoidal, 30-35 μ diam., 40-45 μ long; cystocarps mostly single, sessile on an enlarged obconical base, sur-

rounded by a whorl of 5-8 ramuli which are either short and in part incurved or long and at times giving rise to other cystocarps; carpospores numerous, pyriform to slightly angular, enclosed within a very hyaline membrane; antheridial ramuli less enlarged and less torulose than the tetrasporic ramuli; antheridia completely covering their outer ends.

Epiphytic upon other algæ. Eureka, near La Paz, Lower California. Type, Marchant, no. 78, May.

But a single small tuft of this species was gathered among the other forms found cast ashore. Fortunately all three forms of reproductive cells were present in these specimens, and the whole material seems in typical condition. Having such a small quantity of material, however, leaves us in doubt as to whether or not these are typical in height. The method of attachment to the host is by short, thick rhizoidal branches, a few from a node.

A conspicuous character present in practically all of the fronds, especially prominent in the tetrasporic and antheridial fronds, is the uncorticated internode just above the forking. The upper parts of all the fronds are densely corticated except these special internodes, a character which we have not seen, nor have we read of it in any other species. This is apparently too regular to be accidental, and we are using it as a basis for the specific name. Towards the base, the internodes become less and less corticated, but the length of the internodes only slightly exceeds the length of the nodes.

Ceramium caudatum S. and G. sp. nov.

Plate 27, figs. 55-57

Fronds 10-15 mm. high, branching dichotomous by splitting of the apical cell, many uncinat secondary branches of different lengths, at times in whorls, arising at the nodes; corticated only at the nodes; internodes of main filaments 120-140 μ diam. at the base of the fronds and nodes 180-200 μ diam.; internodes 290-350 μ long at the base of the fronds; tetrasporangia numerous in whorls at the upper margin of the corticating cells, decidedly pedicellate; cystocarps and antheridia unknown.

Floating among other algæ. Eureka, near La Paz, Lower California. Type, Marchant, no. 48b, May.

Ceramium fimbriatum S. and G. sp. nov.

Plate 26, figs. 43, 44

Fronds diminutive, regularly dichotomous, corticated only at the nodes; main filaments 70-90 μ diam. at the nodes, the internodes 2-3 times as long as the nodes in the main fronds; the outer cell on each node on the convex surface of the forcipate apices develops into a short thick hair, rounded at the outer end, 55-65 μ long, 28-32 μ broad, unseptate, soon deciduous; fruiting characters unknown.

Found floating among *Centroceras clavulatum*. Eureka, near La Paz, Lower California. Type, Marchant, no. 87a, May.

We hesitate to name this species of *Ceramium* based on such scanty material at our disposal. Only a few fragments were observed while studying specimens of *Centroceras*. However, the vegetative characters are so unlike those of any described species of which we have any definite knowledge, that we feel justified in naming and describing it as well as the material will permit. The presence of a single row of thick, short, unseptate hairs, which are soon deciduous, on the outer curves of the apices, is the distinguishing character.

Ceramium horridum S. and G. sp. nov.

Plate 26, figs. 49, 50 and plate 79

Fronds 6-8 cm. high, completely corticated throughout, dichotomously branched, the branches gradually attenuated upwards, at maturity terminating in acute cells, clothed throughout with whorls of short, lateral, tetrasporic ramuli arising at each node, which in turn are beset with numerous, short, lateral, sharp spines; main fronds 700-900 μ diam.; tetrasporangia immersed without definite order in the ramuli; cells arranged more or less in longitudinal rows, especially in the internodes 2-3 times as long as broad; cystocarps and antheridia unknown.

Cast ashore among other algæ. Guaymas, Mexico. Type, Marchant, no. 91, May.

The two outstanding characters of this species are the whorls of short tetrasporic ramuli, three to five at each node, and the acute, spine-like growing points at their apices and for some

distance back, as well as on the main branches. The growing points, apical cells, are normal cells during the period of rapid growth, but on nearing maturity of the tetraspores, they practically all divide two to three times and the branches become very acute. The size of the mature plants, the complexity of branching, their habitat, whether epiphytic or growing on rocks, the character of the attaching portions, and the character of the cystocarps and antheridia are matters for further investigation. The few fragments obtained, however, are so decidedly different from any known species, that it seems the part of wisdom to put it on record.

Ceramium sp.

Plate 29, figs. 70, 71

Growing on *Euchcuma* sp. Mazatlan, Mexico, Marchant, no. 63a, May.

Only some small fragments of this species of *Ceramium* were found among other algæ, and these are of antheridial plants. The ramuli were completely corticated only at the fruiting ends, the remaining lower parts are corticated only at the nodes. It seems to be an undescribed species, at least nothing like it was admitted by Agardh in his latest revision, but the absence of other fruit, especially the tetraspores, makes its identity too uncertain and therefore unwise to name it at present.

CENTROCERAS KÜETZING, in *Linnaea*, vol. 15, "1841," p. 731

Volume 15 of *Linnaea* bears the imprint 1841, Kuetzing's paper "Ueber *Ceramium* Ag.," appeared in the last Heft of this volume. In this paper, among other genera, he erected the genus *Centroceras*. In *Phycologia Generalis*, 1843, he treats of the genera and species mentioned in his previous paper, and consistently cites 1841 as the date of publication. Later, in *Species Algarum*, 1849, he consistently refers only to the *Phycologia Generalis* in citing the place of publication of the new genera erected in the above mentioned publication, which

is manifestly misleading. At the same time, in citing the species treated in Linnæa, he uses the date 1842 instead of 1841. Howe (1914, p. 158) cites 1842.

Centroceras clavulatum (Ag.) Mont.

Growing on rocks in the upper sublittoral belt. Tortuga Island, Gulf of California, Johnston, no. 144, May; Eureka, near La Paz, Lower California, Marchant, no. 87, May, and no. 42, May.

Montagne, *in* Durieu, *Flore d'Algerie*, p. 140; Howe, *Mar. Alg. Peru*, 1914, p. 158. *Ceramium clavulatum* Agardh, *in* Kunth, *Syn. Pl. Aeq.*, vol. 1, 1822, p. 2.

Centroceras bellum S. and G. sp. nov.

Plate 26, fig. 48 and plates 40c and 78

Fronds 1-1.5 cm. high, more or less prostrate at the base and attached by numerous pluricellular hairs, 1-3 arising at a node, becoming erect at the outer ends, completely corticated, subsecundly branched; main fronds 110-130 μ diam.; branches all arising at the nodes back of the growing point; tetrasporic ramuli stichidia-like, considerably enlarged above the base for some distance, each tapering very gradually to a blunt terminal growing cell and more or less curved at the apex; corticating cells in very regular longitudinal rows on the older parts of the frond and quadrate, except at the slightly swollen nodes, where they are divided into 2-4 smaller cells, and on the fruiting part of the tetrasporic ramuli; tetrasporangia completely immersed, a single whorl at each node; cystocarps and antheridia unknown.

Cast ashore at Guaymas, Mexico. Type, Marchant, no. 85, June.

The complete cortication with quadrate cortical cells arranged very definitely in longitudinal rows on the main fronds seem undoubtedly to ally this plant with the genus *Centroceras*, rather than with the genus *Ceramium*, to which, however, it is very closely related. These characters, along with the size of the cells and the diameter of the main filaments, make it almost

identical with *Centroceras clavulatum* with respect to those characters in that species, but the total absence of sharp-pointed surface cells, particularly at the apices, so characteristic of *C. clavulatum*, the method of branching which is always sub-terminal, whereas all described species of *Centroceras* have dichotomous branching brought about by longitudinal division of the apical cell, and the method of tetraspore formation, the tetraspores being formed by specialized ramuli, for the most part, make it a very distinct and beautiful species, decidedly different from any other known at present.

Family GRATELOUPIACEÆ

GRATELOUPIA AGARDH, Sp. Alg., vol. 1, part 2, 1822, p. 221

Grateloupia prolongata J. Ag.

Plate 80

Growing in the upper sublittoral belt. San Francisquito Bay, Lower California, Johnston, no. 25, June; San Esteban Island, Gulf of California, Johnston, no. 53a, April; Isla Partida, Gulf of California, Johnston, no. 87, July.

J. G. Agardh, Nya Alg., 1847, p. 10.

We have grouped a series of several plants under this species varying greatly in size and in width of fronds. The type of the species was collected at "Pochetti," Mexico, and Agardh does not mention the size of the plants. De-Toni (Syll. Alg., vol. 4, p. 1565) gives the height of the plant as 10-18 cm. Some of our specimens are 50 cm. high and only 3-5 mm. wide, but others come within the range of the description given by De-Toni. It is quite possible that we are here dealing with more than one species, but until a greater quantity of material can be examined, preferably in its native habitat, the question of their identity will have to remain somewhat in doubt.

Grateloupia squarrulosa S. and G. sp. nov.

Plates 81, 82

Fronds 40-55 cm. high, branching exceedingly variable, of 5-8 orders; main frond more or less percurrent, flat, 5-15 mm. wide, pinnately branched at the margins, with branches very

variable in size, some erect, some patent, others recurved, all with broad bases; the surface, as well as the margins of the main frond, more or less covered with branches, the whole frond thickly beset with short, blunt, branched spines; reproduction unknown; color dark purplish red.

Cast ashore. Smith Island, Gulf of California.

Type: No. 1368, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 60), in June, at **Smith Island, Gulf of California.**

Although we have no fruiting specimens of this species, the gross morphological characters are so unlike any described species that we feel certain of its specific identity. It probably grows at some depth below low tide as the specimens, all incomplete, were found cast up on the shore.

Grateloupia acroidalea S. and G. sp. nov.

Plate 26, figs. 45, 46

Fronds flabellate, flattened, up to 2 cm. high, 0.5-1 mm. wide, attached by a small disk; branching dichotomous from near the base; terminal ramuli swollen at the apices; center of the frond stuffed with fine, branched filaments merging into filaments with larger arachnoid cells, these in turn merging into larger, more or less irregular, cells giving rise to the anticlinal rows of the cortex; tetrasporangia 50-60 μ long, 12-20 μ broad; tetraspores cruciate; cystocarp completely embedded within the frond; antheridia unknown; color very dark purplish red, almost black on drying.

Guaymas, Mexico, Marchant, no. 58, May; on rocks in the upper sublittoral belt, Johnston, no. 121.

Type: No. 1369, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 121), in June, at **Tortuga Island, Gulf of California.**

This species of *Grateloupia* clearly belongs to J. G. Agardh's section of the genus *Chondrophyllum*. It differs from *G. dichotoma* J. Ag. in having decidedly swollen apices, for which character it is named. It is quite near to *G. fastigiata* J. Ag. but is shorter and narrower. Ours has the cystocarps and tetraspores only in the terminal segments.

Grateloupia Howei S. and G. sp. nov.

Plate 83

Fronds membranaceous, up to 30 cm. high and 6 cm. wide, tapering to a small, short stipe attached by a disk, unbranched, or forked near the base and with an occasional marginal lanceolate branch; the whole beset with numerous Gigartinoid spines; color brownish red, nitent on drying; large cells of the subcortex 25-50 μ long.

Cast ashore.

Type: No. 1370, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 113), in April, at **San Esteban Island, Gulf of California.**

We are dedicating this species to Dr. M. A. Howe, to whom we sent specimens for study and for comparison with *G. denticulata* Mont., to which it seems closely related. After comparing it with sections and a photograph of the type specimen of *G. denticulata* he concludes that our plant is not identical with that species.

Grateloupia Johnstonii S. and G. sp. nov.

Plate 84

Fronds flat, membranaceous, up to 40 cm. high, varying much in width, of the same branch in different parts, up to 20 cm. branching pinnate, of 5-6 orders; ultimate pinnules short, subulate, acute, perpendicular to the frond, main branches arising at about 45° angle; color coral red; reproduction unknown.

Cast ashore.

Type: No. 1371, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 88), in July, at **Angel de la Guarda Island, Gulf of California.**

This species of *Grateloupia* seems closely related to *G. squarulosa* but differs in thickness, color, number and character of the ultimate pinnules, and the angle at which the branches arise. Unfortunately the whole life history can not be presented here on account of the lack of fruiting material.

Estebania S. and G. gen. nov.

Fronds complanate, firm-mucilaginous, profusely anastomosing at the dichotomously branched tips; center of the fronds packed with fine, densely intertwined, much branched filaments, surrounded on all sides by 1-2 layers of large ovoid cells merging outwardly into smaller cells, in turn merging into short anticlinal rows of small cells; tetraspores cruciate, not in sori; sexual reproduction unknown.

Lacking cystocarps, we are unable, at present, to classify with complete satisfaction the plants which we are here placing in the new genus *Estebania*. We are assigning them provisionally to the family Grateloupiaceæ. They resemble *Polyopes Bushiæ* in general appearance, but this resemblance is only superficial or remotely so in structure. There is also a resemblance to *Grateloupia dichotoma*. In *Polyopes* the tetraspores are aggregated into sori or nemathecia, while in *Estebania* they are evenly distributed over the fruiting area of the fronds. The general structure, the absence of an apical cell and the cruciate tetraspores more strongly suggest the Grateloupiaceæ than any other family.

Estebania conjuncta S. and G. sp. nov.

Plate 25, figs. 35, 36 and plates 85, 86

Fronds up to 4 mm. broad, dichotomously branched, the branches anastomosing with each other soon after arising; color coral red; central or medullary filaments 3-4 μ diam.; surrounding ovoid cells up to 200 μ diam., thick walled; anticlinal rows of cortical cells 4-7 cells long, 4-6 μ diam., subspherical; tetrasporangia elongated radially; tetraspores cruciate, dividing in three planes.

Floating and entangled among other algæ. San Esteban Island, Gulf of California, Johnston, nos. 53f and 115; San Pedro Martir Island, Gulf of California, Johnston, no. 103, April; Angel de la Guarda Island, Gulf of California, Johnston, no. 130, June.

Type: No. 1372, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 115), in June, at **San Esteban Island, Gulf of California.**

The very pronounced character of this species, a character which we have considered to be of generic rank, is the firm coalescence of the young branches almost as soon as they have arisen, leaving at first a very small open space, almost microscopic. As the fronds grow, this space increases until it may become one or two inches across. This branching is fundamentally dichotomous and is extensive. However, as the plants age proliferations, more or less profuse along the edges of the frond, arise. These very frequently begin to divide dichotomously and a flabellate lateral is produced.

The plants at our disposal are all fragmentary, hence the actual size can not be stated. Nothing is known of their method of attachment or whether they are epiphytic or saxicolous. The fronds are very fragile and flabby. On being soaked in fresh water after having been dried, they soon dissolve, making it very difficult to handle them under such treatment.

POLYOPES J. G. AGARDH, Oefver., 1849, p. 85

Polyopes sinicola S. and G. sp. nov.

Plate 28, fig. 61 and plate 42, b

Fronds complanate, 3-5 cm. high, 3-5 mm. wide, width diminishing from the center of the frond towards the apices at each forking; dichotomously branched; color brown, almost black on drying; medulla composed of very densely compact and intertwined branched filaments merging abruptly on all sides into rows, 10-13 cells long, as seen in cross section, of closely compact, short, cylindrical cells, the terminal cell of each row, or the surface cells being more or less pearshaped; reproduction unknown.

Growing on rocks, in the lower littoral and upper sublittoral belts. Los Angeles Bay, Lower California, Johnston, no. 38, June; Isla Partida, Gulf of California. Johnston, no. 85, July; Angel de la Guarda Island, Gulf of California, Johnston, no. 84d, June.

Type: No. 1373, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 85), in July, at Isla Partida, Gulf of California.

PRIONITIS J. G. AGARDH, Sp. Alg., vol. 2, part 1, 1851, p. 185

Prionitis Sternbergii (Ag.) J. Ag.

Growing on rocks in the upper sublittoral belt. Georges Island, Gulf of California, Johnston, no. 100, April; Tortuga Island, Gulf of California, Johnston, no. 119, June; San Marcos Island, Gulf of California, Johnston, no. 6, June.

J. G. Agardh, Sp. Alg., 1851, p. 190. *Sphærococcus Sternbergii* Agardh, Sp., 1822, p. 275.

We have a series of specimens of *Prionitis* which agree fairly well with the description of *P. Sternbergii* (Ag.) J. Ag. as given by De-Toni (Syll., Alg., p. 1851). The species of this genus are subject to much variation in form, size and extent of branching. Our material proves this to be no exception to the rule. Careful study in the field may reveal several overlapping species.

Prionitis abbreviata S. and G. sp. nov.

Plate 25, fig. 39 and plate 50, b

Fronds fasciculate, 4-6 cm. high, 1.5-3 mm. wide, 500-600 μ thick, tapering to a narrow subcylindrical stipe; apices blunt, branching di-tri-chotomous, the margins with numerous fructiferous (?) pinnules; color dark red; reproduction unknown; medulla packed with fine branched filaments, merging on either side into small parenchymatous cells giving rise to anticlinal rows of cortical cells 2-3 μ diam., 4-6 μ long; cortex about 125 μ thick.

Growing on rocks.

Type: No. 1374, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 53e), in April, at San Esteban Island, Gulf of California.

This species appears to be most closely related to the group of plants of various forms which we have tentatively placed under *P. Sternbergii* (Ag.) J. Ag. The fronds are chiefly thinner, the branching more regularly dichotomous, and the pinnules less numerous than the smaller forms of that species.

Family NEMASTOMACEÆ

SCHIZYMENIA AGARDH, J., Sp. Alg., vol. 2, part 1, 1851, p. 169

Schizymenia Johnstonii S. and G. sp. nov.

Plate 88

Fronds wide-ligulate to lanceolate, with more or less undulate and crisped margins, up to 25 cm. long and 8 cm. broad, about 400 μ thick, tapering abruptly at the base to a short, 1.5-2.5 cm. long, stipe, attached by a very small disk; color dark dull coral red; medulla composed of loose fine hyphæ with thick, soft gelatinous walls, extending in all directions and giving rise towards the surface to dichotomously branched erect filaments terminating in anticlinal rows of 1-3 cells; the basal cells of the short erect filaments spherical, 6-8 μ diam.; surface cells cylindrical, 3-4 μ diam. and 2-2.5 times as long; cystocarps large, completely embedded within the fronds, extending inwards beyond the middle of the frond; antheridia and tetrasporangia unknown.

Growing on rocks in the upper sublittoral belt.

Type: No. 1375, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 56), in July, at Isla Partida, Gulf of California.

Schizymenia Johnstonii seems closely related to *S. undulata* J. Ag. It is, however, slightly thicker, different in color, has a more ovate base and oblong shape, and larger cystocarps which extend deeper into the frond.

Schizymenia violacea S. and G. sp. nov.

Plate 25, figs. 37, 38 and plate 87

Fronds up to 30 cm. long, 15 cm. broad, 230 μ thick, broadly ovate, more or less lacerate and margin slightly undulate; base broad and rounded to subcordate; stipe complanate, about 1 cm. long, attached by a very small disk; color violet purple; medulla composed of fine hyphæ closely packed, merging into

spherical, subcortical cells 10-14 μ diam. terminating in anticlinal rows of 1-2 cells, 4.5 μ diam., 1.5 times as long; cystocarps variable in size, some superficial and some extending to the middle of the frond, very compact; tetrasporangia ellipsoidal, 28-32 μ long, 14-16 μ broad, with cruciate tetraspores very numerous, nearly over the entire frond, except the base.

Growing on rocks in the upper sublittoral belt.

Type: No. 1376, Herb. Calif. Acad. Sci., collected by Ivan M. Johnston (No. 82), in April, at **San Esteban Island, Gulf of California.**

This species of *Schizymenia* has near relations in *S. cordata* J. Ag., *S. apoda* J. Ag., and *S. erosa* J. Ag., judging from the general shape. It has, however, fewer cells in the anticlinal rows and is thinner than any of the three, in fact is the thinnest one yet described except *S. Dubyi*. From this species it differs in having fewer cells in the anticlinal rows and has a more compact medulla.

HILDENBRANDTIA NARDO, Isis, von Oken, 1834, p. 675

Hildenbrandtia rosea Kuetz.

Kuetzing, Phyc. Gen., 1843, p. 384

A few specimens of an encrusting red alga have been found on small pebbles among larger algæ. They have the structure of *Hildenbrandtia rosea* Kuetz. but are sterile.

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EXPLANATION OF PLATES

The drawings have been prepared under the direction of N. L. Gardner by Miss Ruth J. Powell ("del. P."), Miss Anna Hamilton ("del. H.") and by Mr. W. P. Keasby ("del. K."). The photographs were made by Mr. W. C. Matthews.

Plate 12

Chlorogloea regularis S. and G.

Fig. 1. a. Surface view. b. Section view. X 500 (del. H.)

Xenococcus deformans S. and G.

Fig. 2. A sketch showing the plants within the cuticle of the host. X 500 (del. H.)

Hydrocoleum codicola S. and G.

Fig. 3. A group of ends of filaments. X 750 (del. P.)

Entocladia condensata S. and G.

Fig. 4. A surface view. X 125 (del. K.)

Fig. 5. A section view, showing the plant within the cell wall of the host. X 125 (del. K.)

Dermocarpa Reinschii S. and G.

Fig. 6. A group of plants, mostly mature. X 250 (del. K.)

Calothrix nidulans S. and G.

Fig. 7. A group of plants in various stages of development. X 250 (del. K.)

Pringsheimia Marchantæ S. and G.

Fig. 8. A surface view. X 250 (del. H.)

Calothrix nodulosa S. and G.

Fig. 9. A group of mature plants. X 125 (del. K.)

Fig. 10. A group of plants in various stages of development. X 100 (del. P.)

Dermocarpa sp.

Fig. 11. A group of immature plants. X 500 (del. P.)

Dermocarpa Marchantæ S. and G.

Fig. 12. A group of plants, some showing gonidia. X 500 (del. P.)

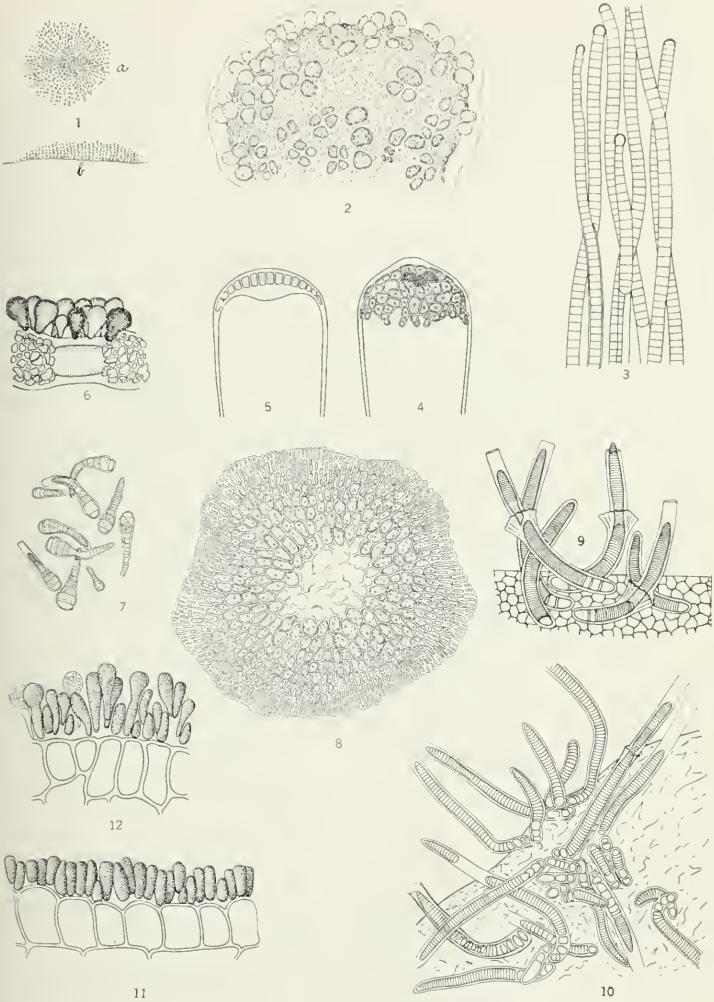


Plate 13

Caulerpa Vanbossea S. and G.

- Fig. 13. A habit sketch. X 0.5 (del. P.)
Fig. 14. A sketch of a portion of a plant showing method of branching
and a few rhizoids. X 2 (del. P.)
Fig. 15. A piece of a filament showing trabeculae. X 25 (del. H.)

Cladophoropsis robusta S. and G.

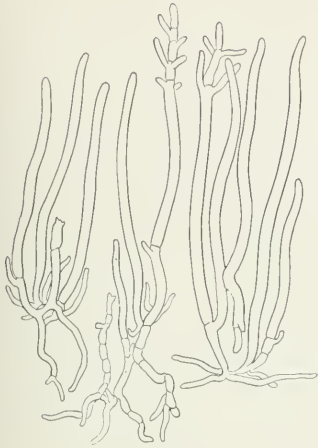
- Fig. 16. A habit sketch. X 2 (del. H.)

Cladophora hesperia S. and G.

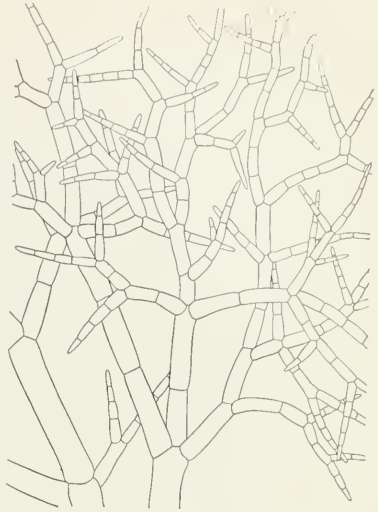
- Fig. 17. A habit sketch. X 40 (del. P.)

Entocladia Polysiphonic S. and G.

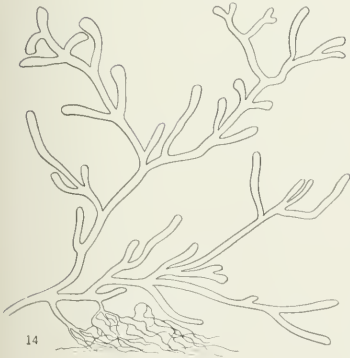
- Fig. 18. A habit sketch of a portion of a plant showing sporangia X 125
(del P.)



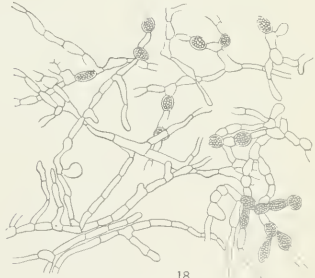
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Plate 14

Codium cervicornis S. and G.

Fig. 19. A group of utricles showing variation in shape and size. X 65
(del. P.)

Fig. 20. A group of typical utricles. X 25 (del. P.)

Codium simulans S. and G.

Fig. 21. A group of utricles showing variation in shape and size. X 65
(del. P.)

Fig. 22. A group of typical utricles. X 25 (del. P.)

Codium reductum S. and G.

Fig. 23. A group of utricles showing variation in shape and size. X 65
(del. P.)

Fig. 24. A group of typical utricles. X 25 (del. P.)

Codium Brandegeei S. and G.

Fig. 25. A group of utricles showing variation in shape and size. X 65
(del. P.)

Fig. 26. A group of typical utricles. X 25 (del. P.)

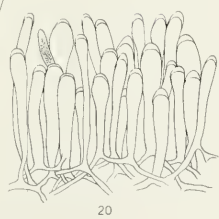


Plate 15

Codium longiramosum S. and G.

- Fig. 27. Three utricles showing different shapes and sizes, the largest ones always having the thinnest end wall. X 38 (del. P.)

Codium amplivesiculatum S. and G.

- Fig. 28. A single utricle of the large thin walled type. X 38
Fig. 29. Two utricles of the smaller type, typical in shape and size. X38 (del. P.)

Codium unilaterale S. and G.

- Fig. 30. A group of utricles showing variation in shape and size. X 65 (del. P.)
Fig. 31. A group of typical utricles. X 25 (del. P.)

Codium conjunctum S. and G.

- Fig. 32. A group of utricles showing variation in shape and size. X 65 (del. H.)
Fig. 33. A group of typical utricles. X 25 (del. H.)



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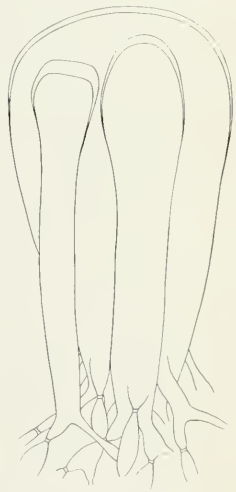
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Plate 16

Codium cuneatum S. and G.

- Fig. 34. A group of utricles showing variation in shape and size. X 65 (del. P.)
Fig. 35. A group of typical utricles. X 25 (del. P.)

Codium anastomosans S. and G.

- Fig. 36. A group of utricles showing variation in shape and size. X 65 (del. P.)
Fig. 37. A group of typical utricles. X 25 (del. P.)

Codium tomentosum (Huds.) Stackh.

- Fig. 38. A group of utricles showing variation in shape and size. X 65. From W. A. Setchell's copy of *Le Jolis Alg. Mar. de Cherbourg*, no. 204. (del. K.)
Fig. 39. A group of typical utricles. X 25. Ibid. (del. K.)

Enteromorpha Marchantæ S. and G.

- Fig. 40. Habit sketch of a group of plants. X 0.5 (del. P.)
Fig. 41. Surface view. X 250 (del. P.)
Fig. 42. Cross section view. X 250 (del. P.)

Enteromorpha acanthophora Kuetz.

- Fig. 43. A habit sketch of a portion of a frond. X 3 (del. H.)



Plate 17

Ectocarpus gonodioides S. and G.

- Fig. 44. Habit sketch of a small tuft of plants, showing the rhizoidal penetrating portion below the gametangia, which are outside of the host. X 125 (del. H.)

Ectocarpus Bryantii S. and G.

- Fig. 45. A series of gametangia showing extremes in shape and size X 250 (del. H.)

Gonodia Johnstonii S. and G.

- Fig. 46. Two branches showing both gametangia and zoosporangia on the same plant. X 250 (del. P.)
Fig. 47. A plant showing only gametangia. X 250 (del. P.)

Gonodia Marchantæ S. and G.

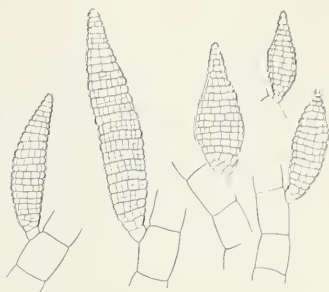
- Fig. 48. A group of filaments with gametangia and one zoosporangium. X 125 (del. H.)

Compsonecma immixtum S. and G.

- Fig. 49. A section through the host, showing the gametangia extending beyond those of the host. X 250 (del. P.)



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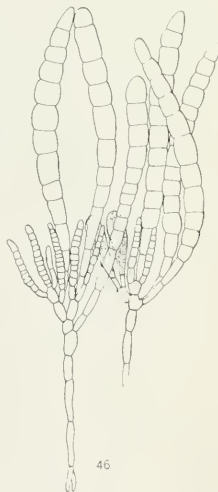
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Plate 18

Dictyota crenulata J. Ag.

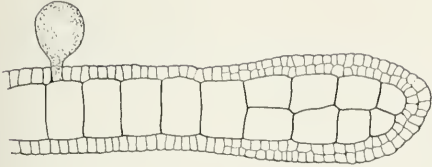
- Fig. 50. A habit sketch of a portion of a frond, showing numerous young plants germinating in position from oogonia. X 2 (del. H.)
- Fig. 51. A surface view of a portion of a frond, showing arrangement of cells, a group of antheridia and a group of oogonia. X 50 (del. H.)

Dictyota hesperia S. and G.

- Fig. 52. A habit sketch of a portion of a frond. X 0.5 (del. H.)
- Fig. 53. A surface view showing arrangement of cells, a group of antheridia and scattered oogonia. X 100 (del. H.)

Dictyota Johnstonii S. and G.

- Fig. 54. A habit sketch of a portion of a frond, showing the method of branching and the distribution of the groups of oogonia. X 0.5 (del. H.)
- Fig. 55. A cross section at the margin of the frond, showing a single oogonium and the double layer of cortical cells and of medullary cells. X 100 (del. H.)
- Fig. 56. Same as fig. 55. X 50 (del. H.)



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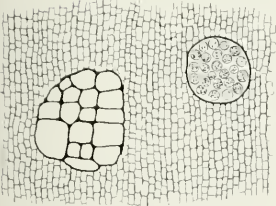
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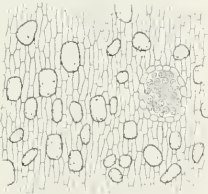
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Plate 19

Entocladia mexicana S. and G.

- Fig. 57. A surface view of a portion of a thallus, showing sporangia scattered over the center and the free filaments around the margin. X 250 (del. H.)

Sphaclaria furcigera Kuetz.

- Fig. 58. Sections of a frond showing one male gametangium and one female gametangium. X 125 (del. K.)

Sphaclaria brevicorne S. and G.

- Fig. 59. A sketch showing a few sections of the frond and a single propagulum. X 250 (del. H.)
Fig. 60. A sketch to illustrate the character of a hair. X 250 (del. H.)

Colpomenia sinuosa f. *deformans* S. and G.

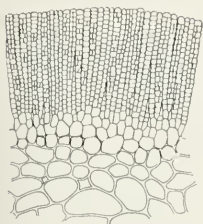
- Fig. 61. A habit sketch showing the great predominance of the finger-like portions of the frond over the base portion. X 0.5 (del. P.)
Fig. 62. A section through the fruiting portion, showing the character of the soma cells and of the gametangia. X 250 (del. P.)

Sargassum Marchante S. and G.

- Fig. 63. A habit sketch of a fragment of a frond, showing the characters of the leaves, the vesicles and the receptacles. X 2 (del. H.)

Sargassum guardiense S. and G.

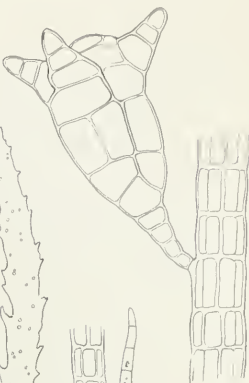
- Fig. 64. A habit sketch of a fragment of a frond, showing the characters of the leaves, the vesicles and the receptacles. X 2 (del. H.)



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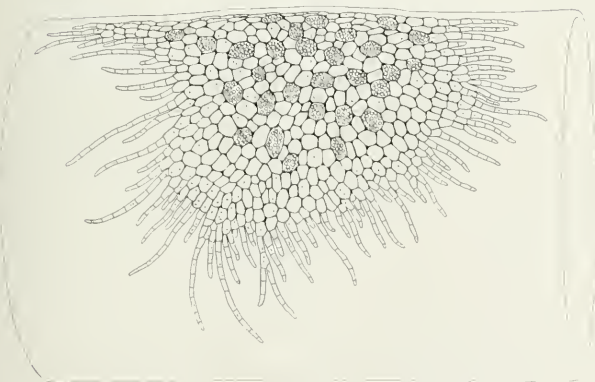
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Plate 20

Sargassum horridum S. and G.

- Fig. 65. A habit sketch showing the character of the leaves. X 1 (del. P.)
- Fig. 66. A habit sketch of a fragment of the frond, showing the characters of the vesicles and the receptacles. X 1.5 (del. P.)

Sargassum insulare S. and G.

- Fig. 67. A habit sketch of portions of a frond, showing the characters of the leaves, vesicles and receptacles. X 1.5 (del. P.)
- Fig. 68. The same as fig. 67, but showing more profuse branching of the receptacles. X 1.5 (del. P.)

Sargassum herporhizum S. and G.

- Fig. 69. A habit sketch of a portion of a frond, showing the characters of the leaves, vesicles and receptacles. X 1 (del. P.)
- Fig. 70. A habit sketch showing the original short stipe and holdfast at the left, a horizontal creeping frond with holdfasts below and erect fronds above. X 0.5 (del. P.)
- Fig. 71. A habit sketch to show different positions of the vesicles. X 1.5 (del. P.)

Sargassum Johnstonii S. and G.

- Fig. 72. A terminal segment of the frond showing the arrangement and characters of the leaves, vesicles and receptacles. X 1 (del. P.)

Sargassum sinicola S. and G.

- Fig. 73. A habit sketch of a fragment of a frond showing the characters of the leaves, vesicles and receptacles. X 2 (del. H.)

Sargassum lapazcanum S. and G.

- Fig. 74. A habit sketch of a portion of a frond showing the characters of the leaves, a single vesicle and the receptacles. X 1.5 (del. P.)



Plate 21

Sargassum Johnstonii f. *laxius* S. and G.

- Fig. 75. A habit sketch of terminal segments of a frond, showing the characters of the leaves, vesicles and receptacles. X 1.5 (del. H.)

Sargassum Johnstonii f. *gracile* S. and G.

- Fig. 76. A habit sketch of a fragment of a frond, showing the characters of the leaves, vesicles and receptacles. X 2 (del. H.)

Sargassum cylindrocarpum S. and G.

- Fig. 77. A habit sketch of a terminal fragment of a frond, showing the characters of the leaves, vesicles and receptacles. X 1 (del. P.)

Sargassum insulare S. and G.

- Fig. 78. A habit sketch of the terminal portion of a frond, showing the arrangement and characters of the leaves and receptacles. X 1.5 (del. P.)

Sargassum Brandegeei S. and G.

- Fig. 79. A habit sketch of a fragment of a frond, showing the characters of the leaves, vesicles and receptacles. X 2 (del. H.)

Sargassum Johnstonii S. and G.

- Fig. 80. A habit sketch of a portion of a frond, showing the characters of the leaves, vesicles and receptacles. X 1.5 (del. P.)

Sargassum Johnstonii f. *laxius* S. and G.

- Fig. 81. A habit sketch of a fragment of a frond, showing the characters of the leaves, vesicles and receptacles. X 1 (del. P.)

Sargassum acinacifolium S. and G.

- Fig. 82. A habit sketch of a fragment of a frond, showing the characters of the leaves, vesicles and receptacles. X 2 (del. H.)

Sargassum Bryantii S. and G.

- Fig. 83. A habit sketch of a portion of a frond, showing the characters of the leaves, vesicles and receptacles. X 1 (del. P.)



Plate 22

Gymnogongrus carnosus S. and G.

Fig. 1. A cross section of a portion of a frond. X 125 (del. H.)

Gelidiopsis tenuis S. and G.

Fig. 2. A longitudinal section of a portion of a frond. X 125 (del. H.)

Asparagopsis Sanfordiana f. *amplissima* S. and G.

Fig. 3. A short lateral branch bearing antheridia. X 30 (del. K.)

Anatheca elongata S. and G.

Fig. 4. A section view showing the characters of the tetrapores. X 200 (del. P.)

Fig. 5. A cross section view of a tetrasporic frond. X 50 (del. P.)

Dicranema rosaliae S. and G.

Fig. 6. A cross section of a mature frond. X 125 (del. H.)

Gracilaria crispata S. and G.

Fig. 7. A habit sketch of a fragment of a frond. X 1 (del. P.)

Fig. 8. A surface view showing groups of antheridia among the soma cells. X 250 (del. P.)

Fig. 9. A cross section of a tetrasporic plant. X 100 (del. P.)

Fig. 10. A section view showing the antheridia in pits. X 125 (del. P.)

Gracilaria Johnstonii S. and G.

Fig. 11. A surface view showing the groups of antheridia among the soma cells. X 125 (del. P.)

Fig. 12. A cross section showing the cortical and subcortical cells of a sterile frond. X 125 (del. P.)

Fig. 13. A cross section showing the antheridia in pits.

Fig. 14. A portion of a complete cross section of a sterile frond. X 50 (del. P.)

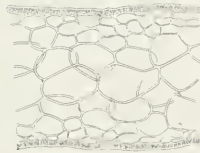
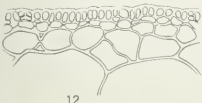
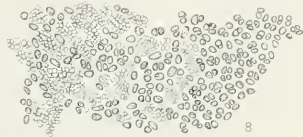
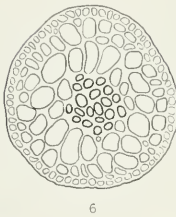


Plate 23

Laurencia obtusiuscula var. *corymbifera* S. and G.

Fig. 15. A habit sketch of the end of a frond. X 2 (del. K.)

Fig. 16. A sketch of a group of tetrasporic ramuli. X 10 (del. K.)

Laurencia obtusiuscula S. and G.

Fig. 17. A sketch of a group of tetrasporic ramuli. X 10 (del. K.)

Laurencia papillosa var. *pacifica* S. and G.

Fig. 18. A sketch of an antheridial ramulus. X. 10 (del. K.)

Hypnea Johnstonii S. and G.

Fig. 19. Sketch of the end of a branch showing the character of the growing region. X 125 (del. K.)

Fig. 20. A sketch of a group of tetrasporic ramuli. X 15 (del. K.)

Fig. 21. A sketch showing the shape, size and arrangement of tetraspores. X 200 (del. K.)

Hypnea Marchante S. and G.

Fig. 22. A sketch of a branch with tetrasporic ramuli. X 15 (del. K.)

Fig. 23. A sketch of the end of a branch showing the character of the growing point. X 125 (del. K.)

Corallopsis excavata S. and G.

Fig. 24. A sketch of a cross section of a tetrasporic branch, showing the disposition of the tetrasporangia, the arrangement of tetraspores and the openings through which the tetraspores escape. Diagrammatic (del. P.)

Fig. 25. A sketch of a tetrasporic ramulus. X 2.5 (del. P.)

Gracilaria subsecundata S. and G.

Fig. 26. A cross section of a tetrasporic frond, showing the cortical and subcortical cells and tetraspores in position. (del. P.)

Fig. 27. A cross section of a tetrasporic frond. (del. P.)

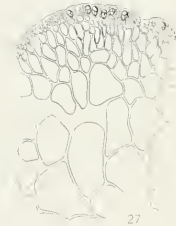
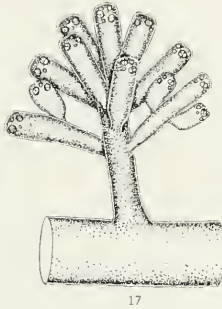
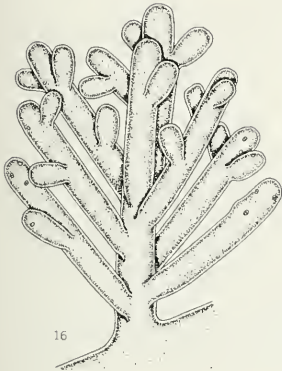


Plate 24

Gracilaria vivipara S. and G.

- Fig. 28. A portion of a cross section of a sterile frond. X 125 (del. H.)
Fig. 29. A portion of a cross section of a tetrasporic frond. X 125.
(del. H.)

Gracilaria pachydermatica S. and G.

- Fig. 30. Habit sketch of a mature frond. X 1 (del. P.)
Fig. 31. A portion of a cross section of a frond near the base. X 125.
(del. H.)

Gymnogongrus carnosus S. and G.

- Fig. 32. A complete cross section of a frond. X 25 (del. H.)

Laurencia papillosa var. *pacifica* S. and G.

- Fig. 33. A sketch of a cluster of antheridia. X 125 (del. K.)

Laurencia estebaniana S. and G.

- Fig. 34. A sketch of a cluster of antheridia. X 150 (del. K.)

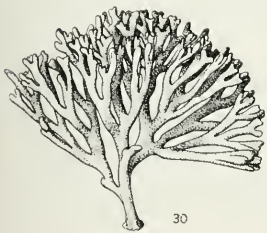
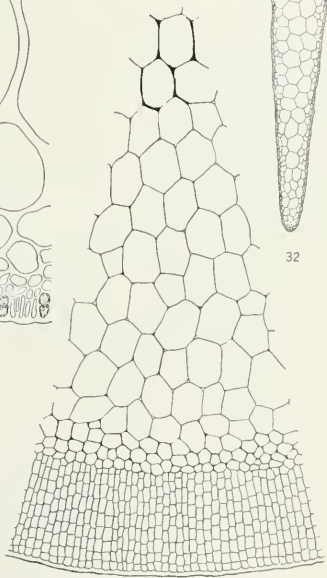


Plate 25

Estepania conjuncta S. and G.

- Fig. 35. A portion of a cross section of a tetrasporic frond. X 125 (del. H.)
- Fig. 36. A portion of a cross section of a tetrasporic frond. X 75 (del. K.)

Schizymenia violacea S. and G.

- Fig. 37. Sketch of a part of a cross section of a cystocarpic frond. X 150 (del. K.)
- Fig. 38. Sketch of a part of the cortex of a tetrasporic frond. X 150 (del. K.)

Prionitis abbreviata S. and G.

- Fig. 39. A sketch of a cross section of a frond extending from the center to the surface. X 250 (del. H.)

Ceramium sinicola S. and G.

- Fig. 40. A sketch of a segment of a tetrasporic branch. X 125 (del. K.)
- Fig. 41. End of the same branch shown in fig. 40. X 125 (del. K.)

Eucheuma Johnstonii S. and G.

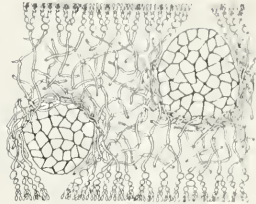
- Fig. 42. A sketch of a single tetrasporangium, showing the inequality in size of the tetraspores. X 125 (del. P.)



35



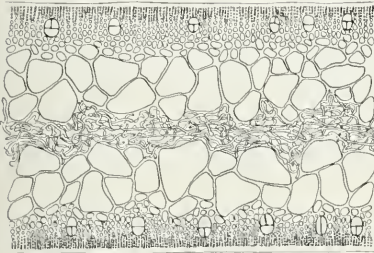
38



37



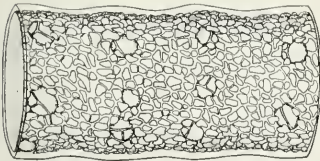
42



36



39



40



41

Plate 26

Ceramium fimbriatum S. and G.

- Fig. 43. A diagrammatic sketch of a fragment of a frond.
Fig. 44. A sketch of a terminal branch. X 125 (del. P.)

Grateloupia acroidalea S. and G.

- Fig. 45. A sketch of a portion of a cross section, vegetative to the left and tetrasporic to the right. X 250 (del. P.)
Fig. 46. A sketch of a mature whole frond. X 1 (del. P.)

Ceramium interruptum S. and G.

- Fig. 47. A sketch of a branched segment of a tetrasporic frond, showing the interrupted cortication. X 50 (del. K.)

Centroceras bellum S. and G.

- Fig. 48. A sketch of segments of a tetrasporic plant. X 125 (del. P.)

Ceramium horridum S. and G.

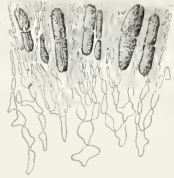
- Fig. 49. A sketch of a terminal fragment of a frond. X 40 (del. P.)
Fig. 50. A sketch of the ends of three branches, the upper one having two growing points. X 125 (del. P.)



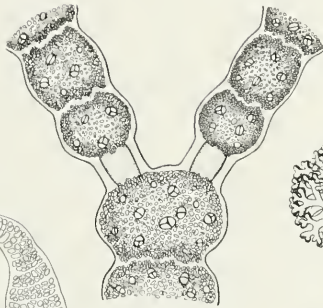
43



44



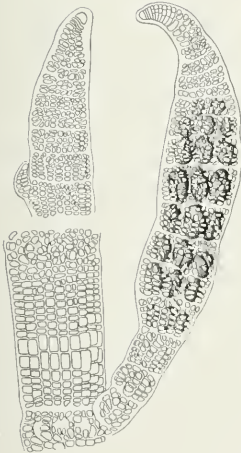
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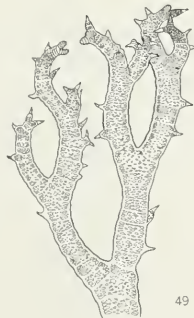
47



46



48



49



50

Plate 27

Ceramium procumbens S. and G.

- Fig. 51. A sketch of a portion of a mature frond, showing mostly opposite branching. X 30 (del. K.)
Fig. 52. A sketch of a short lateral tetrasporic ramulus. X 125 (del. K.)
Fig. 53. A sketch of a cystocarpic ramulus. X 125 (del. K.)
Fig. 54. A sketch of an antheridial ramulus. X 125 (del. K.)

Ceramium caudatum S. and G.

- Fig. 55. A sketch of a segment of a mature tetrasporic ramulus. X 125 (del. K.)
Fig. 56. A sketch of a segment of the main frond near the base. X 125 (del. K.)
Fig. 57. A sketch of the end of a tetrasporic branch. X 125 (del. K.)

Ceramium serpens S. and G.

- Fig. 58. A sketch of a portion of a tetrasporic plant, showing a horizontal filament with attachments and with erect free branches. X 125 (del. P.)



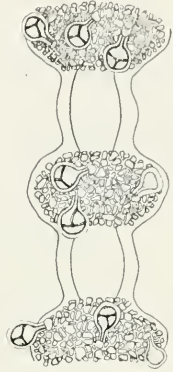
51



52



54



55



53



58



57



56

Plate 28

Heterosiphonia sinicola S. and G.

- Fig. 59. A sketch of a segment of a frond showing the character of the surface cells and of the interior cells. X 60 (del. H.)
- Fig. 60. A cross section of a mature frond. X 75 (del. H.)

Polyopes sinicola S. and G.

- Fig. 61. A cross section of a frond at the margin. X 75 (del. K.)

Callithamnion endovagum S. and G.

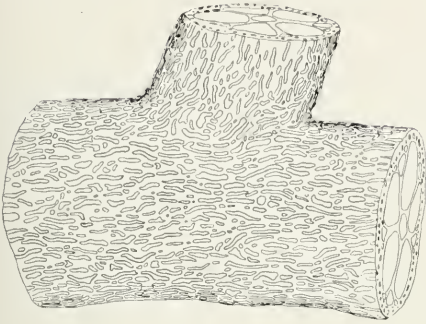
- Fig. 62. A sketch of a cross section of the host, showing the penetrating filaments of the *Callithamnion*, and the free filaments with procarps. X 125 (del. K.)

Colucodasya sinicola S. and G.

- Fig. 63. A sketch of a free filament showing numerous antheridia. X 125 (del. H.)

Ceramium bicornis S. and G.

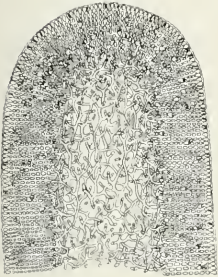
- Fig. 64. Sketches of terminal fragments. X 250 (del. H.)



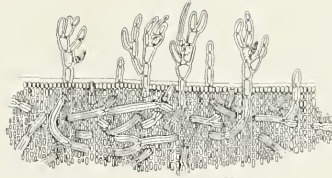
59



63



61



62



60



64



Plate 29

Laurencia sinicola S. and G.

Fig. 65. A sketch of a fragment of a tetrasporic frond. X 4 (del. K.)

Fig. 66. A sketch of a fragment of a cystocarpic frond. X 10 (del. K.)

Laurencia obtusiuscula var. *laxa* S. and G.

Fig. 67. A sketch of a few tetrasporic ramuli. X 10 (del. K.)

Laurencia sp.

Fig. 68. A sketch of a tetrasporic ramulus. X 40 (del. P.)

Fig. 69. A sketch of a fragment of a plant. X 1.5 (del. P.)

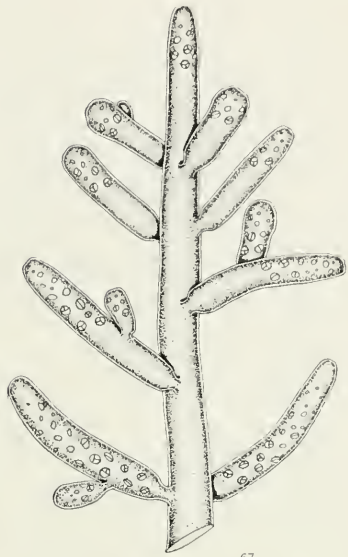
Ceramium sp.

Fig. 70. A sketch of a terminal fragment of an antheridial frond. X
125 (del. P.)

Fig. 71. The same as fig. 70. X 25 (del. P.)



65



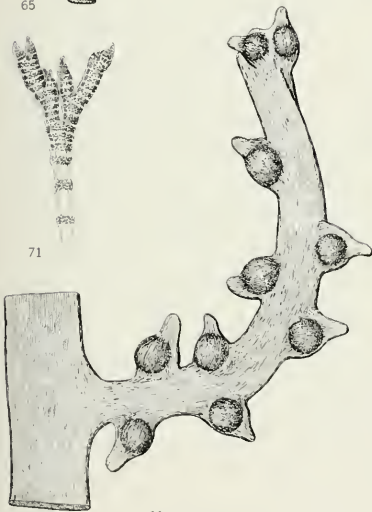
67



71



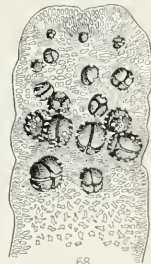
70



66



69



68

Plate 30

Codium Brandegei S. and G.

A photograph of the type specimen.

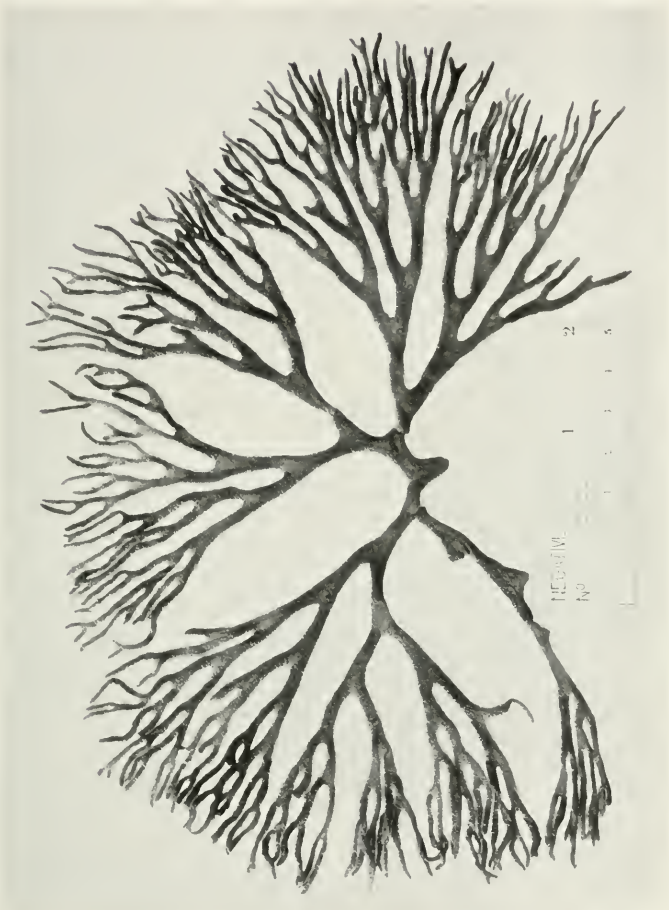
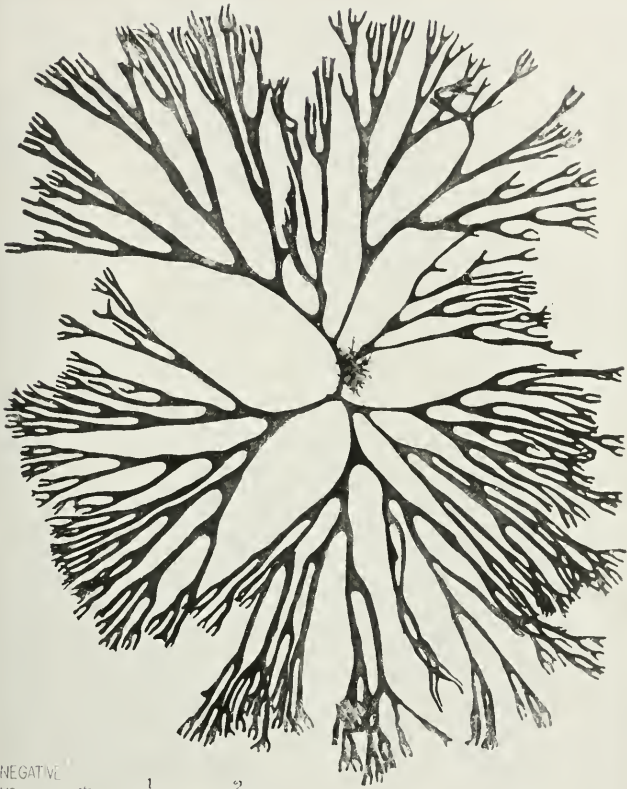


Plate 31

Codium simulans S. and G.

A photograph of the type specimen.



NEGATIVE
No

	1	2
1	2	3
	1	5

Plate 32

A. *Codium conjunctum* S. and G.

A photograph of the type specimen. X 1.

B. *Codium cervicorne* S. and G.

A photograph of the type specimen. X 1.



a



b

Plate 33

Codium reductum, S. and G.

A photograph of the type specimen dried. X 1.



Plate 34

Codium cuneatum S. and G.

A photograph of the type specimen.



Plate 35

Codium amplivesiculatum S. and G.

A photograph of a portion of the type specimen, dried.



Plate 36

Codium unilaterale S. and G.

A photograph of the type specimen. X 1.

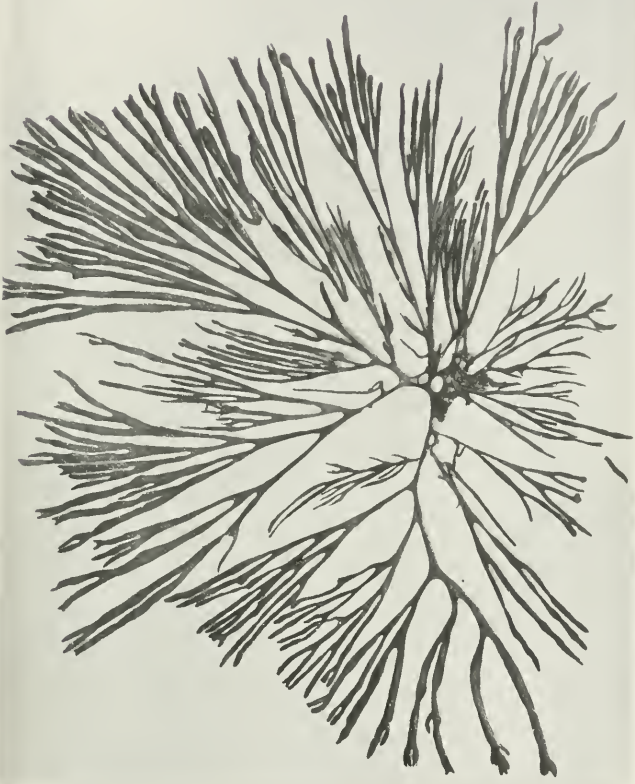


Plate 37

Codium longiramosum S. and G.

A photograph of the type specimen.



Plate 38

Enteromorpha acanthophora Kuetz.

A photograph of a few typical specimens of the collection, Johnston, no. 39. X 1.



Plate 39

Dictyota Johnstonii S. and G.

A photograph of the type specimen. X 1.



Plate 40

A. *Xenococens deformans* S. and G.

A photograph showing the deformed host.

B. *Chondria acrorhizophora* S. and G.

A photograph of two tetrasporic plants showing habit. X 1.

C. *Centroceras bellum* S. and G.

A photograph showing the character of the end of a filament. X 145.



A



B



C

Plate 41

Asparagopsis Sanfordiana f. *amplissima* S. and G.
A photograph of the type specimen showing the general habit.

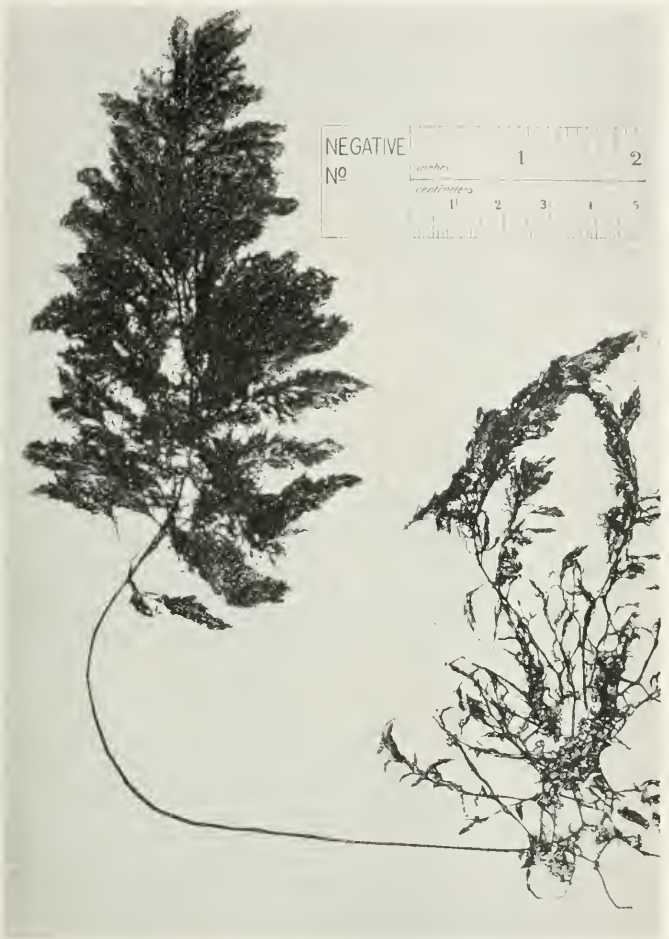


Plate 42

A. *Hypnea Marchantæ* S. and G.

A photograph of a fragment of a tetrasporic plant. X 10.

B. *Polyopes sinicola* S. and G.

A photograph of the type specimen. X 1.



Plate 43

Laurencia papillosa var. *pacifica* S. and G.

A, X 1. B, X 3.



Plate 44

A. *Gracilaria crispata* S. and G.

A photograph of the type specimen. X 1.

B. *Corallopsis excavata* S. and G.

A photograph showing the moniliform tetrasporic branches. X 1.



a



b

Plate 45

A. *Laurencia estebaniana* S. and G.

A photograph of the type specimen. X 1.

B. *Laurencia obtusiuscula* var. *corymbifera* S. and G.

A photograph of the type specimen. X 1.

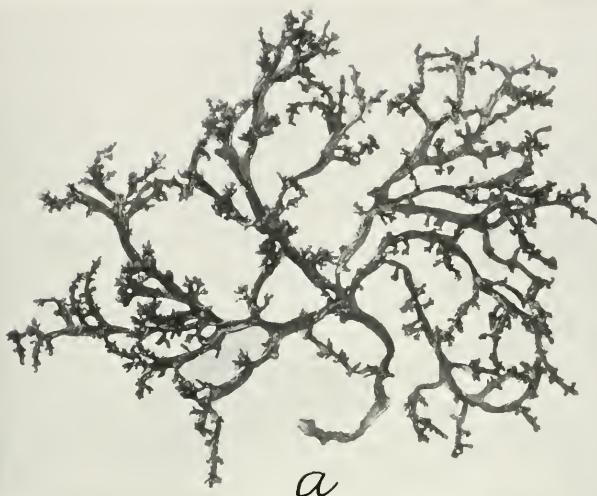


Plate 46

A. *Gelidium Johnstonii* S. and G.

A photograph of a fragment of a cystocarpic plant. X 4.

B. *Gigartina Chauvinii* (Bory) Mont.

A photograph of the type specimen. X 1.

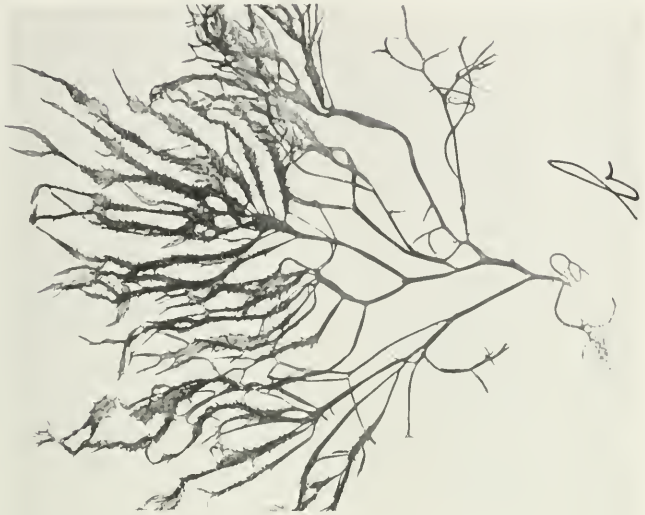


Plate 47

A. *Gymnogongrus carnosus* S. and G.

A photograph of the type specimen. X 1.

B. *Heterosiphonia sinicola* S. and G.

A photograph of the type specimen. X 1.



Plate 48

Corallopsis excavata S. and G.

A photograph of the type specimen. X 0.5.

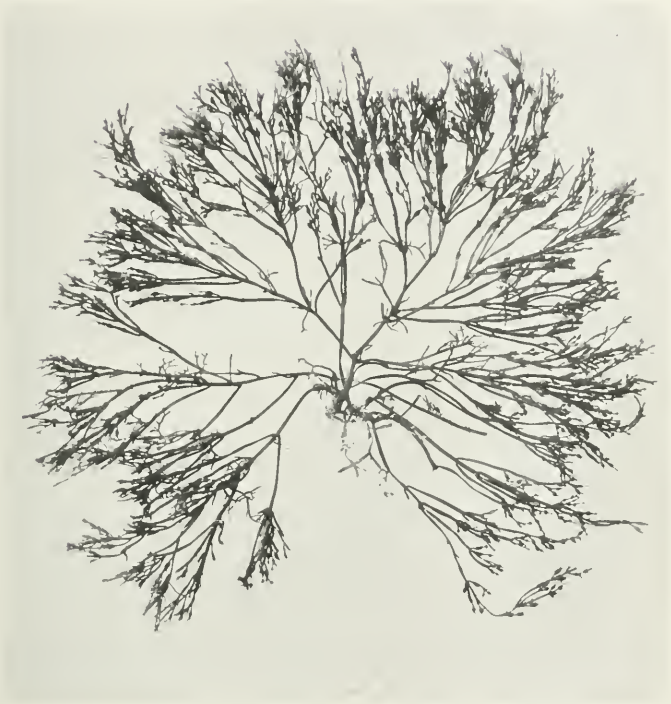


Plate 49

A. *Polysiphonia Marchantii* S. and G.

A photograph of the type specimen. X 1.

B. *Callymenia pectusa* S. and G.

A photograph of the type specimen. X 1.



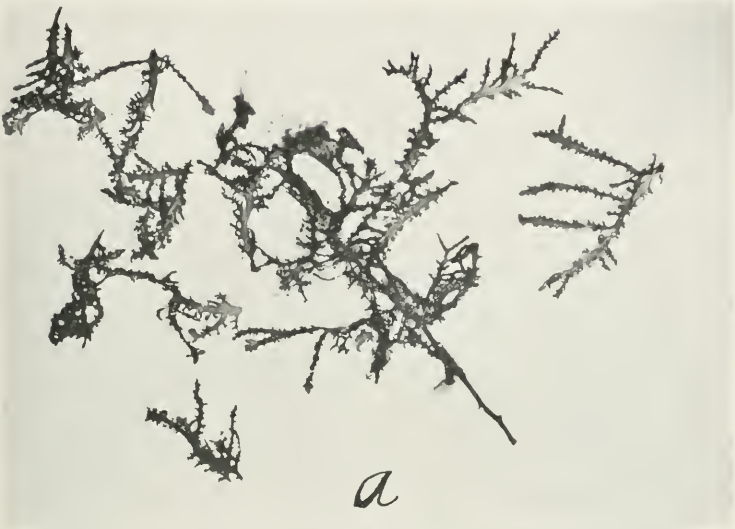
Plate 50

A. *Laurencia sinicola* S. and G.

A photograph of the type material.

B. *Prionitis abbreviatus* S. and G.

A photograph of the type specimen. X 1.



a



b

Plate 51

A. *Callophyllis Johnstonii* S. and G.

A photograph of the type specimen of a cystocarpic plant. X 1.

B. *Callophyllis Johnstonii* S. and G.

A photograph of a tetrasporic plant. X 1.

C. *Gracilaria lacerata* S. and G.

A photograph of typical specimens. X 1.

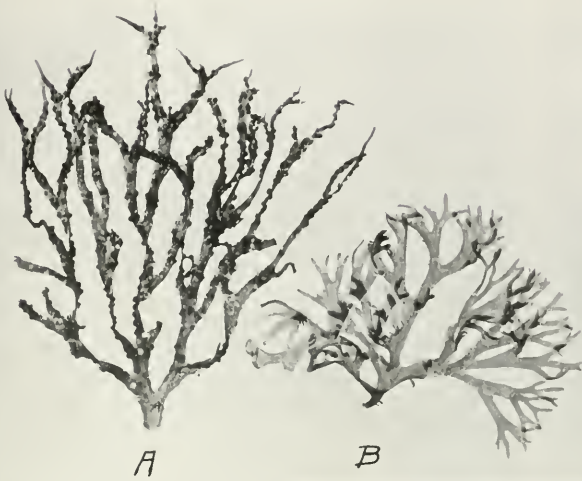


Plate 52

A. *Laurencia Johnstonii* S. and G.

A photograph of a small plant. X 1.

B. *Laurencia obtusiuscula* var. *laxa* S. and G.

A photograph of the type specimen. X 1.



Plate 53

Laurencia Johnstonii S. and G.

A photograph of the type specimen. X 1.



Plate 54

Laurencia papillosa var. *pacifica* S. and G.

A photograph of the type specimen. X 1.



Plate 55

Laurencia obtusiuscula S. and G.

A photograph of the type specimen. X 1.



Plate 56

Hypnea Marchantii S. and G.

A photograph of the type specimen, (a) tetrasporic, (b) sterile. X 1.

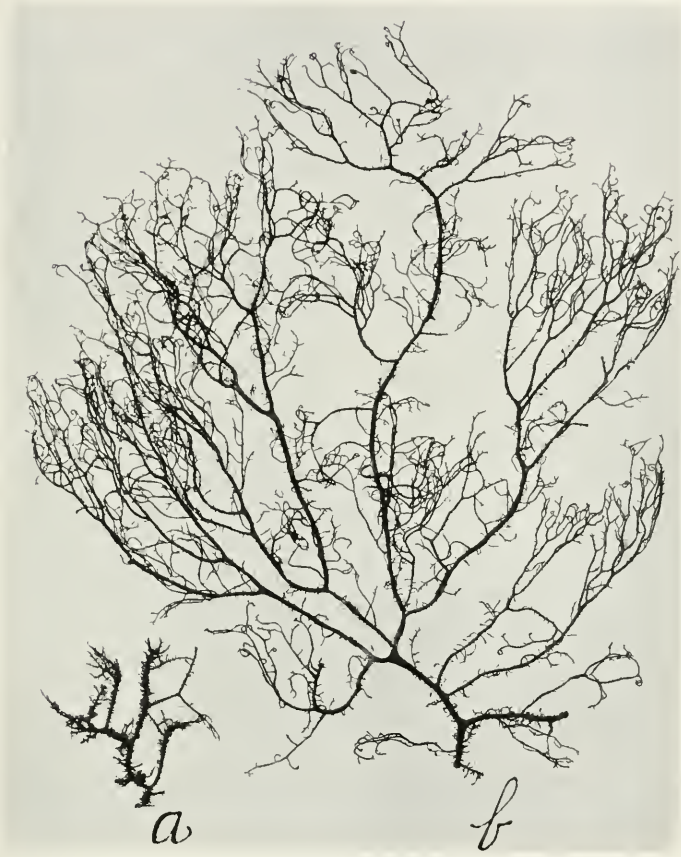


Plate 57

Hypna Johnstonii S. and G.

A photograph of the type specimen. X 1.

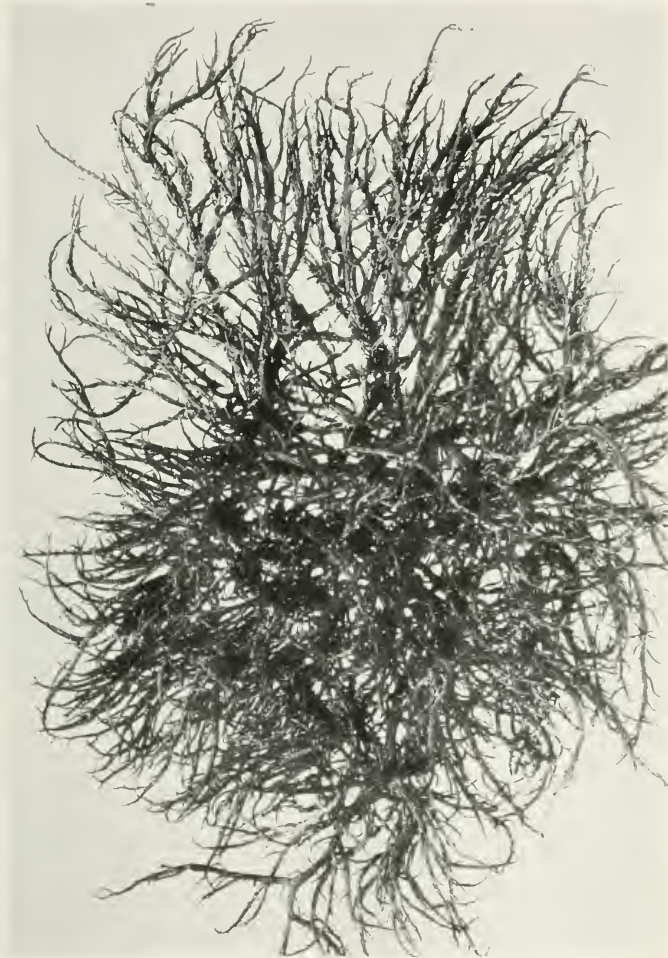


Plate 58

Gracilaria sp. X 1.

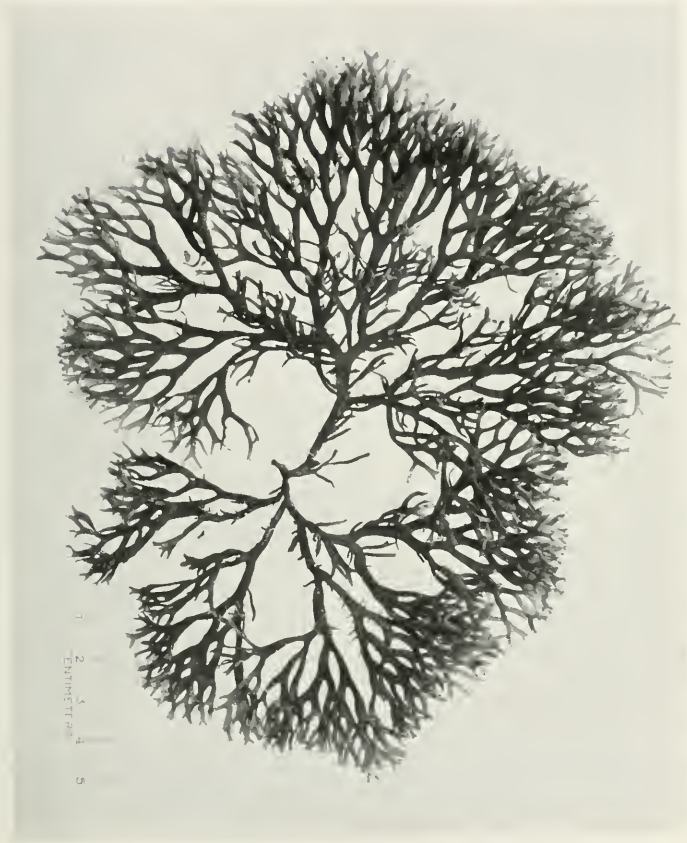
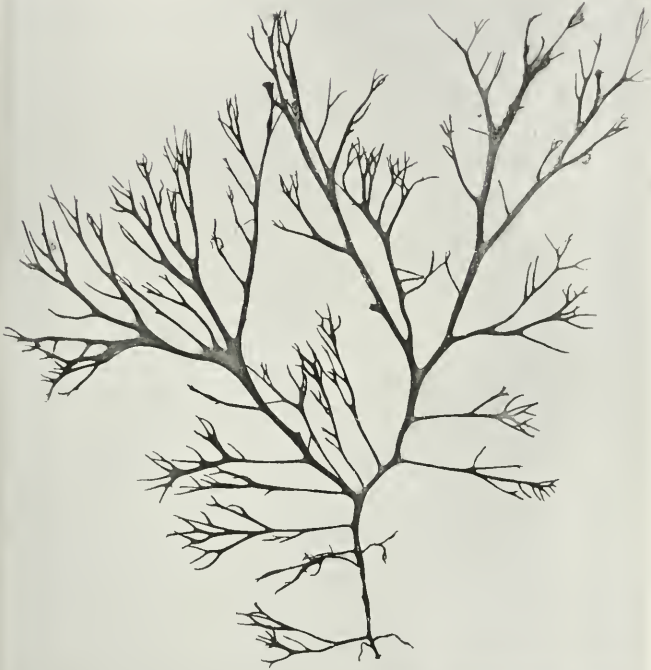


Plate 59

Gracilaria subsecundata S. and G.

A photograph of the type specimen. X 1.



1 2 3 4 5
CENTIMETERS

Plate 60

Gracilaria Johnstonii S. and G.

A photograph of the type specimen. X 0.5.



Plate 61

Gracilaria pinnata S. and G.

A photograph of typical fragments of sterile plants. X 1.

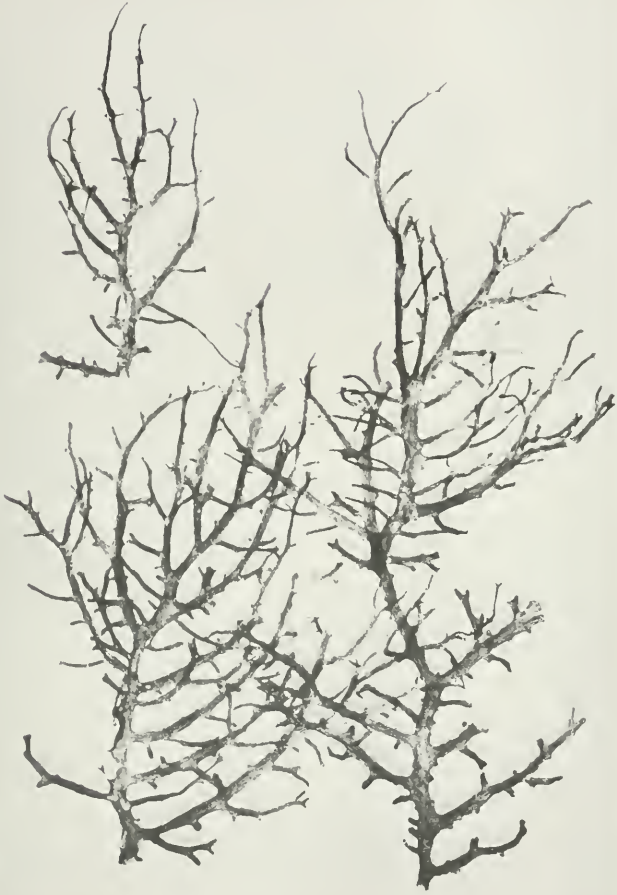


Plate 62

Gracilaria sinicola S. and G.

A photograph of the type specimen. X 23.



Plate 63

Gracilaria vivipara S. and G.

A photograph of the type specimen. X 23.



Plate 64

Gracilaria Friesii Howe.

A photograph of a sterile specimen.



Plate 65

Eucheuma Johnstonii S. and G.

A photograph of a fragment of a tetrasporic plant. X 1.



Plate 66

Eucheuma Johnstonii S. and G.

A photograph of a fragment of a tetrasporic plant. X 2.



Plate 67

Eucheuma uncinatum S. and G.

A photograph of a fragment of a tetrasporic plant, showing the branched character of the uncinuate ramuli. X 3.



Plate 68

Eucheuma uncinatum S. and G.

A photograph of the type specimen of cystocarpic plant. X 1.



Plate 69

Anatheca elongata S. and G.

A photograph of the type specimen.



Plate 70

Gigartina Chauvinii (Bory) Mont.

A photograph of a wide specimen. X 2/3.



Plate 71

Gelidium decompositum S. and G.

A photograph of the type specimen. X 1.



Plate 72

Gelidium Johnstonii S. and G.

A photograph of the type of a cystocarpic specimen. X 1.



Plate 73

Gelidium Johnstonii S. and G.

A photograph of the type of a tetrasporic specimen. X 1.



Plate 74

Ceramium bicorne S. and G.

A photograph of the type specimen, cystocarpic. X 10.



Plate 75

Ceramium sinicola S. and G.

A photograph of fragments of tetrasporic plants. X 10.



Plate 76

Ceramium Johnstonii S. and G.

A photograph of a typical portion of a tetrasporic plant with numerous proliferations. X 6.5.

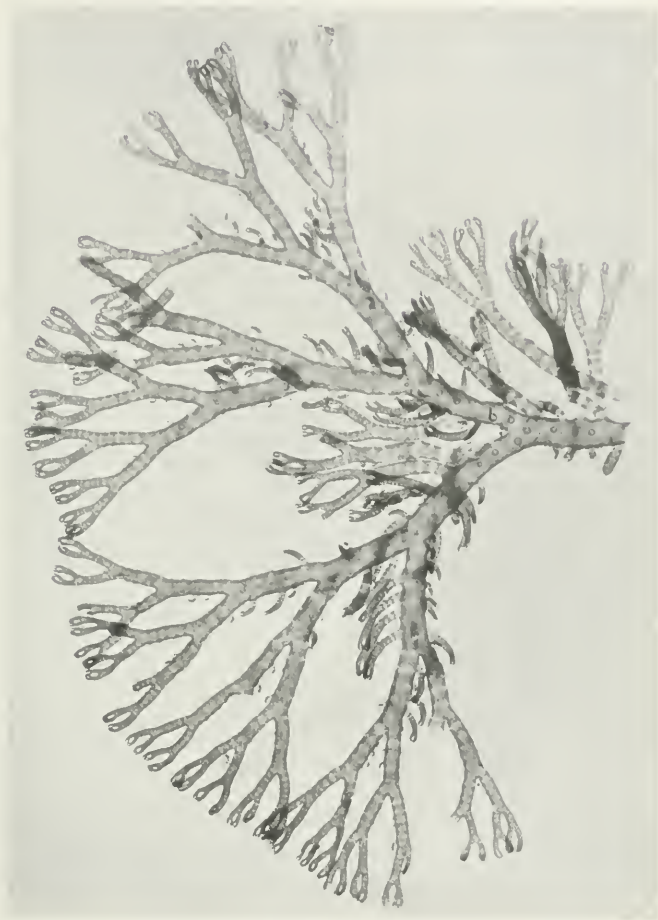


Plate 77

Ceramium Johnstonii S. and G.

A photograph of typical fragments of a tetrasporic plant nearly free from proliferations. X 10.



Plate 78

Centroceras bellum S. and G.

A photograph of typical fragments of tetrasporic plants, showing the single undivided growing points. X 10.



Plate 79

Ceramium horridum S. and G.

A photograph of typical tetrasporic plants. X 5.

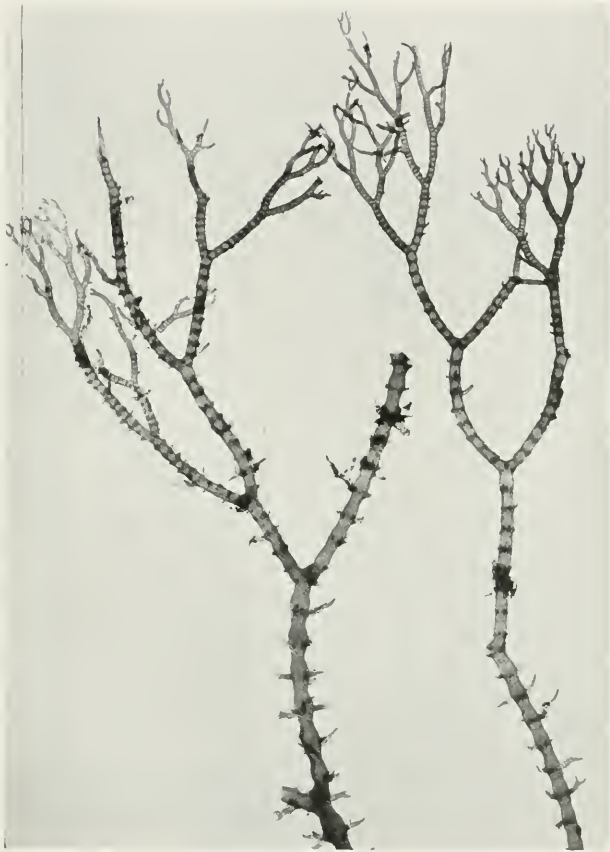


Plate 80

Grateloupia prolongata J. Ag.

A photograph of a group of long narrow plants. X 0.3.



Plate 81

Grateloupia squarrosa S. and G.

A photograph of a portion of the type specimen. X 0.75.



Plate 82

Gratcloufia squarrulosa S. and G.

A photograph of a portion of a sterile frond. X 3.



Plate 83

Grateloufia Howcii S. and G.

A photograph of a group of typical specimens.

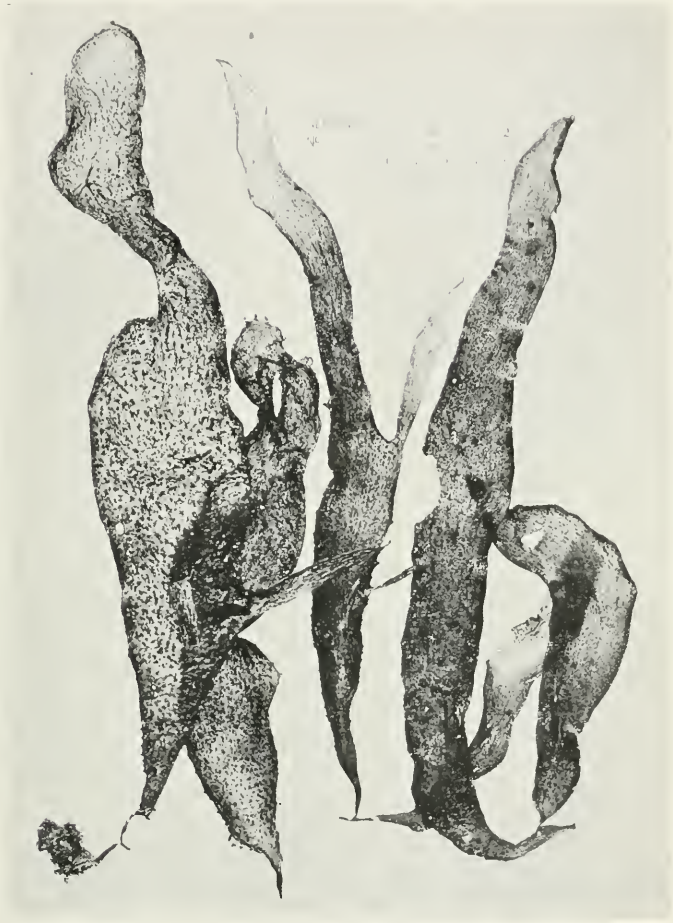


Plate 84

Graciloupa Johnstonii S. and G.

A photograph of the type specimen. X 0.5.



Plate 85

Estebania conjuncta S. and G.

A photograph of the type specimen. X 2.

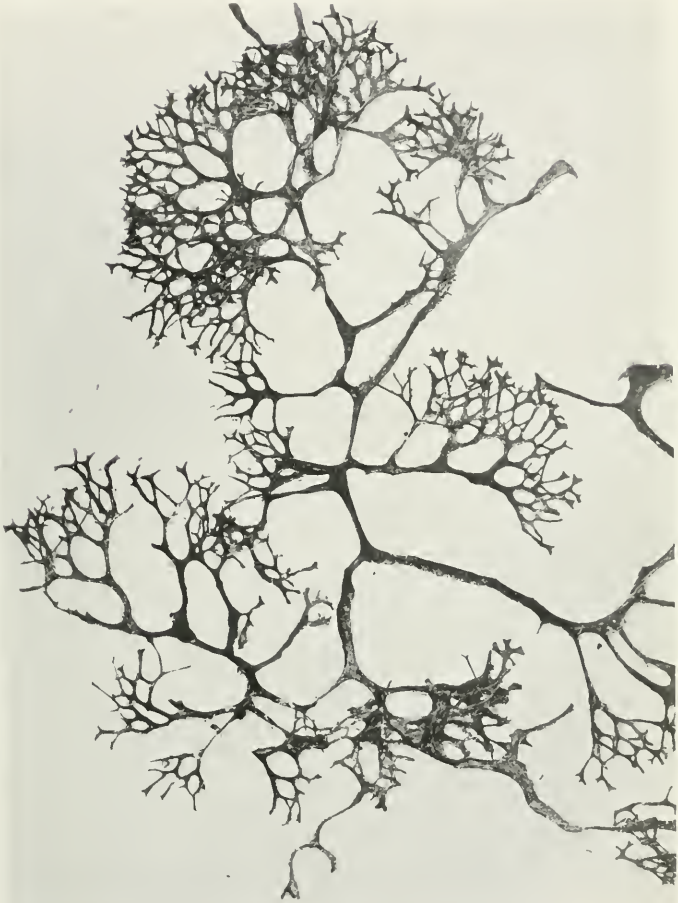


Plate 86

Estebania conjuncta S. and G.

A photograph of a specimen with only slight anastomosing. X 2.



Plate 87

Schizymenia violacea S. and G.

A photograph of the type specimen.



NEGATIVE
No. 1 2
1 2 1 1 5

Plate 88

Schizymenia Johnstonii S. and G.

A photograph of the type specimen.



Boundary between Mexico and the United States

Los Coronados Is.

COLORADO RIVER

C. Sn. Quintin

Concepcion Rock

Georges Is.

ANGEL DE LA GUARDIA I.

TIBURON I.

CARMEN I.

SAN JOSEF I.

ESPIRITU SANTO I.

CERALBO I.

San Luis Gonzales Bay

Angel de la Guardia I.

Patos Is.

Los Animas Bay

Tiburon I.

Kino Pt.

San Francisco Bay
Santa Teresa Bay

San Pedro Martiri

San Pedro Bay

SONORA

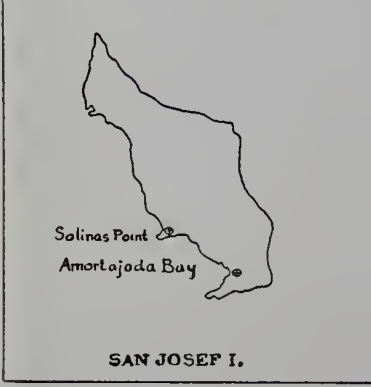
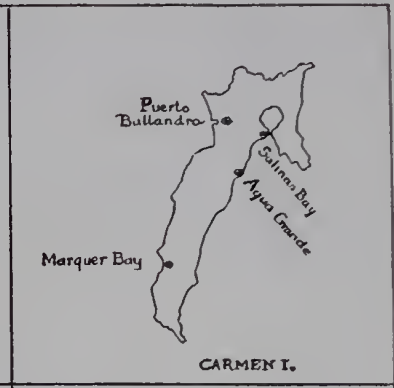
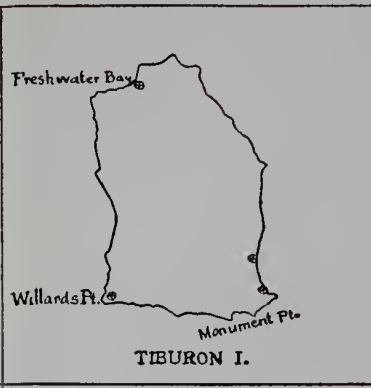
LOWER

San Benito Is.

Cedros I.

SEBASTIAN VISCAINO BAY

Pt. Sn. Eugenio



30°
30'
29°
30'
28°
30'



GULF OF CALIFORNIA

SHOWING ROUTE OF CALIFORNIA
ACADEMY OF SCIENCES 1921
EXPEDITION

Based on Charts No. 620, 621, 1006
U.S. Hydrographic Office

Drawn by G. Dallas Hanna

PROCEEDINGS
OF THE
CALIFORNIA ACADEMY OF SCIENCES
FOURTH SERIES

VOL. XII, No. 30, pp. 951-1218, with map MAY 31, 1924

XXX
**EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921**

**THE BOTANY
(THE VASCULAR PLANTS)**

BY
IVAN MURRAY JOHNSTON

From the middle of April to the middle of July, 1921, the writer was botanist of the expedition which the California Academy of Sciences sent out for the biological exploration of the islands and shores of the Gulf of California. During the three months spent on the expedition, collections were made on all the 30 odd important islands in the gulf, at five localities in Sonora, and at 14 localities on the peninsula of Lower California. The present paper embodies the results which have been derived from the collections, field observations, and subsequent herbarium studies. Although especially concerned with the flora of the gulf islands and shores, the paper contains much relating to the flora of Lower California.

GEOGRAPHY

The peninsula occupied by the territory of Lower or Baja California is the boldest feature of the west coast of Mexico. It has a width varying between 50 and 225 kilometers and

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extends southeastward for about 1600 kilometers, spanning 10 degrees of north latitude ($22^{\circ} 53'$ to $32^{\circ} 42'$) and nearly eight degrees of west longitude ($117^{\circ} 8'$ to $109^{\circ} 25'$). Between this peninsula and the mainland coast, occupied by the Mexican states of Sonora and Sinaloa, occurs the narrow strip of water called the Gulf of California. The gulf varies from 100 to 200 kilometers in width, and, like all the other topographic features of the region, has a southeasterly trend. Within the Gulf of California there are about 40 islands with areas of 20 to 1000 square kilometers, and about as many more islets and rocks. These islands and rocks are mainly close to shore; only opposite the middle of the peninsula do they extend out towards midgulf.

GEOLOGY

The gross features of the peninsula of Lower California are the result of extensive block faulting which has tilted, except in the extreme south, the component mountain blocks towards the west. This is strikingly evidenced in the oriented front with which the peninsular mountain blocks face the gulf, particularly so in the huge cliff-like escarpments that form the gulf-face of the Sierra Giganta, and in the abruptly arising east face of the granitic ranges that occupy the northern half of the peninsula. Practically every section across the peninsula (cf. Darton, *Jour. Geol.*, 29:722, f.2-4. 1921) shows a definite and often considerable tilting towards the west. The present features of the peninsula resulted mainly from an extensive uplift in late Tertiary time. The subsidence and deepening of the trough of the present gulf was probably contemporaneous with the peninsular uplift. The peninsula has not, however, been in a static condition since the close of the Tertiary. The wide occurrence and the variable heights of Pleistocene and Recent sediments show that elevation and subsidence has occurred, and that the movements were not general, but rather of local character, the various mountain blocks being affected very unequally. The submergences during Pleistocene and Recent were probably very short and are not to be compared with the very general inundations during the Tertiary.

The Gulf of California is a submerged trough lying between the elevated areas that now form the peninsula and the Mexican mainland. Structurally, it is intimately related to the area in California now occupied by the Colorado Desert, that area of negative altitude being usually considered the dried-out northern part of the ancient Gulf of California which has been cut off from the lower gulf by a delta-dam built by the Colorado River. The present gulf is not a very deep body of water. A narrow tongue 2000 meters in depth extends up midgulf for 250 kilometers to somewhere opposite San Josef Island, and a broader tongue of 1000 meters depth extends as far north as San Pedro Martir Island. Depths of 500 meters occur north to the straits between Angel de la Guarda and Tiburon islands, but north of that point the gulf gets no deeper than 200 meters and averages considerably less. With the exception of the straits just mentioned, there is no suggestion of the occurrence or previous existence of a land bridge across the gulf. The gulf seems to be a trough which gradually lessens in depth from the middle towards the sides, and from the mouth towards the head.

Little seems to be on record regarding the larger phases of the geology of the Sonoran coastal region. That region appears to consist largely of volcanic hills and sandy plains. It seems probable that most of the Sonoran coast arose from the sea at about the same period as the land across the gulf. The hills about Guaymas and for about 80 kilometers to the north are volcanic, consisting of basalt, tufa, and agglomerate. In the hills behind Guaymas a number of old sea-caves were noted which, though now over 50 meters above the ocean, contained unconsolidated sands and modern shells. This indicates recent movement in at least one section of the coast. South of Guaymas the mountains recede and a broad low sandy plain fronts the ocean. About 90 kilometers north of Guaymas another sandy plain faces the sea. From the latter projects a volcanic mass, similar to the adjacent Pelican Island, bearing the name of Kino Point. The range of hills which appears on the mainland opposite Tiburon Island is probably volcanic like the island. About Tepoca Bay the hills are scorix-covered, but the bluffs along the shore are recent alluvium.

Roughly speaking, the peninsula of Lower California consists of three grand petrographic divisions: a northern granitic region, a central volcanic-sedimentary region, and an extreme southern granitic region. Regarding these regions the following facts are of interest:

The half of the peninsula north of latitude 28° is characterized by its diverse relief and by an abundance of intrusive rocks. Vulcanism seems to have played only a minor part in the formation of this area. Along this section the prevailing light color of the rocks was particularly noted since it contrasted so with the brown which was the dominant color in the region just south. No large sedimentary deposits were seen, but here as in all other parts of the gulf, are numerous elevated beaches several meters above the present level of the gulf. Along the western side of this section of the peninsula Eocene beds are reported as common (Darton, Jour., Geol., 29:728. 1921). Emmons and Merrill (Bull. Geol. Soc. Amer., 5:503-511. 1894) have found evidences of peneplaining in the interior, as well as travertine beds supposed to have been derived from lake deposits. Tectonic forces have been recently active in the area, for Wittich (Mem. Soc. Cien. Antonio Alzate, Mexico, 35:122. 1920) reports the occurrence near San Borja Mission of an elevated beach containing modern shells, although at an altitude of 1052 meters.

The gulf islands off the northern part of the peninsula are peculiar in that they are almost wholly volcanic, whereas the adjacent peninsula seems to be largely granitic. They appear to represent a range of partially submerged hills separated from the adjacent peninsula by a channel of over 400 meters depth. Angel de la Guarda, Smiths, Sal si Puedes, and North and South San Lorenzo, certainly belong to the same group, as shown by their uniformity in structure and their alignment. It is probable that San Esteban also belongs to this group, for though nearer to Tiburon Island it is surrounded by depths, and is composed of rock which seems to indicate affinities with the islands to the west of it. San Esteban Island has scoriæ-covered slopes and much breccia. Tiburon Island is volcanic (Jones, Mining World, 32:269-270. 1910), but not so pronouncedly so as Angel de la Guarda Island and its associates, and seems to be structurally similar to the hills on

the adjacent Sonoran coast from which it is separated only by a shoal channel averaging less than 4 meters depth. South San Lorenzo Island is topped by a thick bed of gypsum which is probably of similar age and origin as the gypsum deposits about Santa Rosalia which Fuchs (*Soc. Geol. France*, III, 14:81. 1886) seems to consider late Miocene or early Pliocene. Although Angel de la Guarda Island is entirely volcanic, in the harbor at the north end (Puerto Refugio) there is an islet composed of a coarse-grained granite. San Luis Island, which lies 100 kilometers northwest of Angel de la Guarda Island, is wholly volcanic, being composed of ash and basalt, and probably is to be associated with the local evidences of volcanic activity observed back of San Luis Gonzales Bay.

The second petrographic division of the peninsula is characterized by a relative scarcity of intrusive material and by a uniformity of topography. It consists primarily of a huge, tilted, cañon-cut, lava-capped plateau. From the gulf it is grandly picturesque. At the north end stands the triple peak of the volcano of Las Tres Virgines. A little farther south there begins a huge wall which shows the truncate strata of the faulted blocks that form that section of the peninsula. This tremendous scarp-face, which rises only a few kilometers from the gulf shore and stretches away for many kilometers as an imposing wall 1000 to 1500 meters high, is called the Sierra Giganta. Its rocks are evidently stratified and, according to Darton (*Jour. Geol.*, 29:745. 1921), consist of a mixture of late Tertiary sandstones, conglomerates, agglomerates, tufas, and lavas. Only bedded volcanic fragments were seen in the cañons visited. Gabb (*Browne, Resources Pac. Coast, Lower Calif.*, 115. 1868) reporting that the volcanic fragments in the agglomerates decrease in size, number, and attrition as the strata approach the west, suggests that the beds may have been derived from a mid-Tertiary land-mass lying to the east of the present peninsula. What are assumed to be Pliocene deposits were frequent along this section of the peninsula. The plain back of San Nicolas Bay consists of a series of gently sloping and very fossiliferous strata which probably are to be correlated with the beds occurring near Loreto and on the level plain of Coronados Island. On Mon-

serrate Island and on the south end of Carmen Island there are also large, slightly dipping fossiliferous beds. Elevated beaches of recent date are common, but are particularly well developed at Puerta Ballandra on Carmen Island where a fine fossil coral-reef was noted.

The islands of the midsection of the peninsula are various in structure. Tortuga is a recently extinct volcano separated from the peninsula by a depth of 1300 meters. San Marcos seems to be partly granitic (?) and partly gypsum, and is connected to the peninsula by shoals scarcely eight meters deep. Ildefonso seems to be a basaltic mass similar to San Pedro Martir. Coronados consists of a pile of basalt situated upon (?) a sedimentary plain and connected by shoals to the peninsula. Danzante and Espiritu Santo (the latter belonging to the third section of the peninsula) both have structures similar to that in the Sierra Giganta and probably represent less elevated fragments of that mass. Carmen (Cook, Eng. & Mining Jour., 85:545-546. 1908), San Josef (Mex. Bol. Minero, 2:504-505. 1916), Monserrate, San Diego, Santa Cruz, and Catalina all seem largely composed of intrusives, perhaps of the pre-Cretaceous granitic rocks which Darton (Jour. Geol., 29:725. 1921) indicates as underlying the peninsula. With the exception of Tortuga and Ildefonso, all the islands in this part of the gulf connect with the peninsula through shoals or obvious alignments with topographic features. This is well exemplified in the case of Catalina, Santa Cruz, San Diego, and San Josef which are in line and composed of the same rock yet separated by depths of from 80 to over 400 meters.

The third petrographic division of the peninsula consists of that area south of La Paz which is commonly known as the cape region or cape district. It is a very definite division since it is separated from the area immediately north by a sandy plain of less than 30 meters altitude. This plain was probably flooded in comparatively recent times and the present cape region was then an island. The district is very rough, consisting of several compact mountain ranges (Nelson, Mem. Nat. Acad. Sci., 16:62-65. 1921). The highest and most massive mountain block, which forms the western half of the region, consists of granite, but the eastern half is formed of

metamorphic and volcanic rocks and even, according to Eisen (Proc. Calif. Acad. Sci., II, 5:754. 1895), scattering beds of limestone. The cape region has its abrupt face on the west and appears to slope towards the east. It is therefore the only exception to the prevailing westerly tilt of the peninsula. Tertiary deposits are reported by Wittich (Boll. Soc. Geol. Mex., 6:7. 1909) to be common, and the same author speaks of an abundance of elevated beaches (Globus, 97:379. 1910).

There are two islands lying off the cape region. Ceralbo is granitic and lines up with Punta Arena de la Ventana from which it is separated by a channel of 150 meters depth. Fossiliferous sediments, probably of Pliocene age, are perched on the island near Ruffo's Ranch. Espiritu Santo seems to have the relation to the Sierra Giganta already indicated. It is composed of large tilted stratified deposits of volcanic material which are resting upon granitic rocks that are well exposed along the east side of the island (Darton, Jour. Geol., 29:725, f.4, sec. 21. 1921). The island is separated from the peninsula by a shoal channel the maximum depth of which is 15 meters. The point of land forming the eastern arm of La Paz Bay appears to be wholly volcanic, but though Espiritu Santo is connected to it by shoals, the two may not be structurally related inasmuch as they show a lack of agreement in the bolder features of structure.

CLIMATE

Since Nelson (Mem. Nat. Acad. Sci., 16:95-102. 1921) has treated the subject in detail, the climate of the region will here be discussed only in the most general way; suffice to say that the islands in, and the area surrounding, the Gulf of California are decidedly arid, the annual rainfall averaging under 5 centimeters. The yearly precipitation is not only small, but is irregular in occurrence and quantity, the region being subjected to alternations of wet and dry years. In the extreme north the rains occur mainly in the winter, but over the remainder of the gulf area they come usually between July and October. As in the deserts to the north, the region about the gulf is visited by short cloudbursts which may pour out on a small area as much as 1.5 decimeters of rain and put

raging torrents into the broad commonly dry washes. The visit to the gulf area was made following a year of very light rain and during the closing months of the dry season. During the last days of June showers occurred along the Sonoran coast about Guaymas, and when that area was visited a week later many shrubs were found hastening into bloom.

During spring and summer the gulf is visited by north-westerly breezes which are preceded in winter by heavy winds from the same direction. With the coming of autumn and the rainy season the region is harried by fierce electrical storms coming from the southeast. These fall storms, the so-called *condonazos*, blow violently for several days and at times become so furious as to be very destructive to life and property on the peninsula.

In the gulf area the average winter temperature is between 20° and 25° C. The hottest months are in the summer and early autumn, when temperatures of 30° to 40° C. are common. During the summer the gulf waters become very warm, in the south as high as 25° or 30° C., too hot for enjoyable bathing.

PHYTOGEOGRAPHY

Floristically, the region about the Gulf of California, here loosely designated as the "gulf area," is not homogeneous, nor, as might be supposed, is it essentially similar to the adjacent region immediately north of the international boundary. It was observed that two distinct floras are present within the gulf area. One was recognized as very similar to the flora of Southern California (this largely a modified austral one); the other was strange and later found to be a southernly-derived, arid, tropical flora. Very roughly, it may be said that the floristic break in the gulf area occurs at about 29° 30' N. latitude. Of course the flora does not change abruptly when that latitude is crossed, but the total effect on either side of it is different and the difference becomes more pronounced as it is left behind. The two principal floras of the gulf area may be taken as constituting a northern or Californian, and a southern or Sinaloan province.

The northern province of the gulf area has the flora of southern California weakly diluted by tropical elements. This flora

in its characteristic form was found on the peninsula at San Luis Gonzales Bay, but south of that point its hold on the territory seems to consist only of insignificant local areas. At San Felipe Bay, north of San Luis Gonzales Bay, the flora, as listed and photographed by MacDougal (Carnegie Inst. Wash. Publ. 99:42-43, t. 45-47. 1908), is essentially that of the Colorado Desert. The flora of the delta of the Colorado River and the area adjacent is even more strongly like that of the Colorado Desert (MacDougal, op. cit., 33-34 and 40-42). A nearly typical Colorado Desert landscape and flora were found on the Sonoran coast at Tepoca Bay. The same flora occurs in a diluted form on the north end of Tiburon Island. It is also to be noted that 70% of the plants collected in the Pinnacle Mountain Region (Contr. U. S. Nat. Herb. 16:7-20. 1912), an area southeast from the Colorado River delta, represent species found in the Colorado Desert of California.

The plants which may be considered typical of the northern province in the gulf area are: *Fouquieria splendens*, *Opuntia bigelovi*, *Parosela spinosa*, *Franseria ilicifolia*, *Frankenia palmeri*, *Coldenia palmeri* and *Encelia farinosa*. Within the province the flora may be strikingly like that of the Colorado Desert, as for example, at San Luis Gonzales Bay and Tepoca Bay where most of the following grew together:—*Larrea divaricata*, *Encelia farinosa*, *Fouquieria splendens*, *Parosela spinosa*, *Parosela emoryi*, *Hyptis emoryi*, *Onoclea tesota*, *Prosopis chilensis*, *Franseria dumosa*, *Bebbia juncea*, and *Opuntia bigelovi*, as well as such lowly plants as *Cryptantha angustifolia*, *Coldenia palmeri*, *Oenothera cardiophylla*, *Trichoptilium incisum*, *Perityle emoryi*, *Hofmeisteria pluriseta*, *Trixis californica*, *Simmondsia chinensis*, *Peucephyllum schottii*, *Psathyrotes ramosissima*, *Parosela mollis*, *Eriogonum inflatum*, *Mohavea confertiflora*, and *Mirabilis tenuiloba*.

Little is known of the land immediately back of the coast in Sonora, but the evidence at hand seems to indicate that the tropical elements range much farther northward in the interior than they do along the gulf. A more detailed statement can be made of the peninsula flora which lies back from the gulf coast. As Nelson (Mem. Nat. Acad. Sci., 16:117-118, t. 31. 1921) has shown, the northern part of the peninsula is clearly occupied by three very distinct life-districts, all continuations

of districts occurring north of the international boundary. First, there is the northeast corner of the peninsula consisting of the narrow gulf-fronting plain east of the high mountains, which has a flora almost wholly that of the Colorado Desert and which is characteristic of the Lower Sonoran Zone of this area (cf. Abrams, Bull. N. Y. Bot. Gard. 6:321-322. 1910). Second, there are the conifer-clad summits of the high mountain which run for over 200 kilometers south from the international boundary and which have a dilute boreal flora characteristic of the Canadian and Transition zones (cf. Abrams, op. cit., 303-312). Third and finally, there is the northwest part of the peninsula lying west of the high mountains and extending southward to about Rosario in which there occurs the dilute Upper (?) Sonoran Zone flora characteristic of the San Diego Bay Region (cf. Abrams, op. cit., 319-320). Nelson has named these three biotic areas the Colorado Desert District, the San Pedro Martir District, and the San Diegan District. Brandegee (Zoe. 4:199-210. 1893) has listed the most conspicuous species of the San Pedro Martir and San Diegan districts. In the interior of the peninsula most of the Californian species seem to reach their southern limit near the southern end of the San Pedro Martir Range at about N. lat. 30°, but along both coasts they appear to push a little further southward.

The southern province of the gulf area has a flora evidently derived from the arid tropical flora of Sinaloa and southern Sonora. When compared with the northern province it presents a group of genera almost completely different, and a vegetation which seems more lignescent. On the peninsula, it is this section that has developed such startling types as *Vetchia discolor*, *Fouquieria columnaris*, and *Machærocereus eruca*, as well as a large number of peculiar but unobtrusive forms which all together warrant the treating of this southern part of the peninsula as a distinct division of the Mexican arid tropical flora. This peninsular flora breaks up into two districts, the Cape Sierran District and the Comondú District.

The Cape Sierran District includes the higher parts of the cape region and at least the higher cañons of the Sierra Giganta. It is small in area, but highly interesting, having a flora with affinities in California and in the Mexican highlands.

It is characterized by *Pinus cembroides*, *Glaucothea brandegeei*, *Populus monticola*, *Nolina beldingi*, *Arbutus peninsularis*, and *Quercus devia*, as well as by many other less conspicuous species. Brandegee (Zoe. 3:226. 1892) in his general paper on the cape region mentions many species of this district, designating them as growing on the "mountain tops." The Cape Sierran District represents the Upper and Lower Sonoran zones, which, due to their narrowness in the present case, had best be treated as one.

The Comondú District is the largest and most important floral district on the peninsula, and is populated by species which in immediate origin are almost exclusively tropical. The whole district is to be classed as belonging to the Arid Tropical Zone. With the exception of the minor areas occupied by the Cape Sierran District, all the peninsula lying south of N. lat. 30° appears to belong to the Comondú District. Due to its large size and great range of topography, the district is very rich in species, many of which are endemic.

Taken as a whole, the Comondú District is characterized by such common trees and shrubs as *Fouquieria peninsularis*, *Burscra rhoifolia*, *Jatropha spathulata*, *Pachycereus pringlei*, *Machrocereus gummosus*, *Atamisquea emarginata*, *Stegnosperma halimifolia*, *Viscainoa geniculata*, and *Pithecollobium confine*. As would be expected in any such attenuated area spanning so much latitude, the factor of geographic isolation has come into play and the flora shows tendencies to form minor phytogeographic areas that occupy definite segments on the peninsula. Within the Comondú District this segmenting tendency of the flora has resulted in the formation of three subdistricts which correspond more or less closely with the petrographical divisions of the district. These are called the Viscaino Desert Subdistrict, the Sierra Giganta Subdistrict, and the Cape Subdistrict.

The Viscaino Desert Subdistrict occupies the Viscaino Desert and the granitic country lying north of the volcanic region, or very roughly, a little more than the northern middle quarter of the peninsula. This subdistrict is characterized particularly by *Veachia discolor* var. *pubescens* and by *Fouquieria columnaris*, but is also indicated by the endemic *Sideroxylon leucophyllum*, *Salvia californica*, *Aster frutescens*,

Maurandya flaviflora, *Cuscuta vetchii*, *Perezia palmeri*, *Gilia palmeri*, *Loeselia gloriosa* (*Gilia gloriosa* Brandg.), *Pclucha trifida*, and *Phacelia pauciflora*. The subdistrict was first defined as a district by Nelson (Mem. Nat. Acad. Sci. 16:118-119, t.31. 1921) who erred in referring it to the Upper Sonoran Zone rather than to the Arid Tropical Zone. The bulk of the widely distributed and feature-forming peninsular trees and shrubs reach their northern limit within this subdistrict. The flora of the Viscaïno Desert Subdistrict is characterized, and certainly is populated, by species and genera of plants whose relations are undoubtedly southern. The inclusion of this subdistrict in the same zones as the districts to the north seems therefore very unnatural. That there is a profound change in the flora just south of the 29th parallel may be seen from the fact that *Viscaïnoa geniculata*, *Jatropha spathulata*, *Yucca valida*, *Fouquieria peninsularis*, *Pedilanthus macrocarpus*, and *Stegnosperma halimifolia* all appear near that latitude, and the large *Bursera*s and columnar cacti extend but a short distance north of it. The Viscaïno Desert Subdistrict fronts on the gulf from about Los Angeles Bay south to the beginning of the volcanic region in about latitude 28°. It includes Angel de la Guarda Island, and probably San Esteban and San Lorenzo islands.

The Sierra Giganta District consists of the lower slopes of the Sierra Giganta and the sandy plain at their base. It extends south to about latitude 24° 30' where it is replaced by the Cape Subdistrict. The characteristic plants are *Vetchia discolor*, *Justicia insolita*, *Gossypium harknessii*, *Ephedra peninsularis*, *Prosopis palmeri*, *Mascagnia macroptera*, *Ditaxis brandegei*, and *Ruellia californica*. This subdistrict has many abundant species in common with the one south of it. Among these are *Ficus palmeri*, *Lysiloma candida*, *Forchammeria watsoni*, *Wilcoxia striata*, *Rhizophora mangle*, *Jacquemontia castwoodiana*, *Celosia floribunda*, *Melochia tomentosa*, and *Euphorbia xanti*.

The Cape Subdistrict is probably the best known section of the Comodú District and consists of the lower levels of the cape region. It is characterized by *Maba intricata*, *Washingtonia sonora*, *Lysiloma microphylla*, *Bursera cerasifolia*,

Cyrtocarpa edulis, *Gossypium davidsonii*, *Gochnatia arbore-scens*, *Castela peninsularis*, *Coulterella capitata*, *Ruellia peninsularis*, and *Turnera humifusa*. Brandegee (Zoe 3:223-231. 1892) gives a description and analysis of the "Flora of the Cape Region," but unfortunately does not distinguish between the low altitude flora characteristic of the Comondú District and the montane flora characteristic of the Cape Sierra District.

There is a group of species which range the entire length of Lower California and into California and Arizona. The most conspicuous of these are *Bcloperone californica*, *Hibiscus denudatus*, *Olneya tesota*, *Larrea divaricata*, *Bursera microphylla*, *Euphorbia eriantha*, *Simmondsia chinensis*, *Lycium richii*, and *Porophyllum gracile*.

Data are not at hand for a satisfactory attempt at indicating the floral districts of the Sonoran coastal belt. The vicinity of Guaymas is the only locality in the region which is at all well known and it seems to have a flora somewhat similar to that occurring in the Comondú District, particularly the Cape Subdistrict, on the peninsula. The range of hills which extends along the coast north of Guaymas seems to contain much of the Guaymas flora which also reappears very diluted on the south end of Tiburon Island. The flora about Guaymas, judging from the outstanding species such as *Jacquimia pungens*, *Acacia willardiana*, *Guaiacum coulteri*, etc., appears to extend northeastward towards Hermosillo and Ures and thence southward towards Sinaloa. As already indicated, the northern part of the Sonoran coast has a southern continuation of the Colorado Desert flora.

At San Pedro Bay, about 20 kilometers west of Guaymas, the flora is extremely anomalous. Associating with distinctly Sonoran species, are *Lysiloma candida*, *Ficus palmeri*, *Acacia californica*, *Glaucothea armata*, *Carloxwrightia fimbriata*, etc., all characteristically peninsular or insular plants not otherwise known from the Sonoran mainland. The study of this local pocket of peninsular species in its relations to present and past distribution in the gulf area is an interesting problem for some future phytogeographer.

ECOLOGY

Ecologically, the gulf area is composed of a number of different communities of which at this time it seems best to mention only the most important. The plant communities of the area readily break up into halophytic and xerophytic groups.

The halophytic communities occur primarily along the shore of the ocean. In the south gulf province there is a well-developed littoral community composed of *Rhizophora mangle*, *Laguncularia racemosa*, and *Avicennia nitida* which reaches its best development in coves and esteros where the water is still. Of the three, *Rhizophora* is the most successful, growing in greatest abundance and in the deepest water. Tide-flats, salt-marshes, and salt-flats are common features along the gulf coast. In shallow places periodically submerged *Salicornia pacifica* is the characteristic and prevalent plant. Associated with it are *Monanthochloë littoralis* and *Batis maritima*, and in the north province *Salicornia europæa* and *Frankenia grandiflora*. Weakly saline flats are frequent and perhaps represent irregularly flooded areas or recently elevated land in the process of freshening. The characteristic plant of these flats is *Suaeda ramosissima*, a plant which over the south province is accompanied by *Maytenus phyllanthoides*. In the vicinity of Guaymas, *Zizyphus sonorensis* and *Eupatorium sagittatum* are also common on the saline flats. Several species of *Atriplex* frequent alkaline areas as do also *Lycium richii* and *Vallesia glabra*. Beaches along the gulf are composed of either cobblestones or sand. When the latter they are usually naked but occasionally covered with stems of *Vaseyanthus insularis*. The only typical arenicolous strand plants are *Ipomæa pes-capræ*, which carpets the beaches south of La Paz, and *Abronia maritima*, which is local on the upper beach through the gulf area. Other minor species of the strand are *Jouvea pilosa*, *Euphorbia incerta*, and *Euphorbia leucophylla*, all from the south province. Thickets of *Allenrolfea occidentalis* and *Frankenia palmeri* almost universally cover the banks at the head of sand beaches in the northern part of the gulf area. The dune communities are varied and interesting. In the north they have a suffrutescent flora composed of *Frankenia palmeri*,

Franseria dumosa, and the southerly ranging *Palafoxia linearis* and *Parosela emoryi*. In the south *Aplopappus arenarius*, *Wislizenia refracta*, *Parosela divaricata*, and *Houstonia mucronata* become the characteristic dune shrubs. *Perityle robusta* is a very conspicuous annual in the south while on the dunes of the Sonoran coast *Helianthus niveus* is very noticeable. Many of the gulf islands are at present, or evidently were in the past, bird rookeries, and their surfaces are stained and their meagre soil impregnated with the phosphates of guano. On the guano islands the flora usually consists of a low cover of *Atriplex barclayana* and *Amaranthus watsoni*, and to a minor extent also of *Cressa truxillensis*, *Trianthema portulacastrum*, and *Portulaca pilosa*.

The xerophytic communities compose the flora of the areas back from the coast. The most prolific and characteristic one found in the gulf area is that of gravelly flood channels or washes. Over most of the region, gravelly cañon floors have a dense growth composed of *Olneya tesota*, *Viscainoa geniculata*, *Atamisquea emarginata*, *Prosopis chilensis*, *Simmondsia chinensis*, *Hyptis emoryi*, *Cercidium microphyllum* and *Bursera rhoifolia*, most of which are joined in the south by *Lysiloma candida*, *Fouquieria peninsularis*, *Celosia floribunda*, *Karwinskia humboldtiana*, *Jatropha spathulata*, *Gossypium harknessii*, and *Opuntia cholla*. The hillsides have a characteristic, but not a very rich association of species. In the north, *Fouquieria splendens*, *Encelia farinosa*, and *Larrea divaricata* predominate, but in the south province the slopes have a rather monotonous cover of *Bursera microphylla*, *Fouquieria peninsularis*, *Jatropha spathulata*, *Pachycereus pringlei*, *Lysiloma candida*, and a variety of agaves and mammillarias. The flora of the gravelly coastal plain is a dilution of that of the washes. It is a notable fact that generally speaking, the coastal flora becomes more dense and luxuriant progressively southward. The cliffs possess a distinct flora, the most conspicuous element being *Ficus palmeri*. The other plants of this community are *Hofmeisteria pluriseta*, *Sympetaleia rupestris*, *S. aurea*, *Hofmeisteria classifolia*, *H. fasciculata*, *Maurandya flaviflora*, *Aristolochia brevipes*, *Coreocarpus dissectus*, and various lactif-

erous mammillarias. The *Ficus* and the species of *Sympetaleia* and *Hofmeisteria* are frequent on the cliffs facing the sea.

RELATIONSHIPS AND ORIGINS OF THE BIOTA

The northernmost section of the peninsula has what is very evidently only a southern extension of the flora of California, but the southern two-thirds has a flora clearly and definitely allied to, and derived from, the flora now occupying Sinaloa, southern Sonora, and the states of southern Mexico. The latter relationship is shown by the presence on the peninsula of such genera as *Maytenus*, *Ficus*, *Lysiloma*, *Colubrina*, *Rhizophora*, *Ruellia*, *Bursera*, *Antigonon*, and a host of others. As a rule, those plant species of wide-spread genera which occur in southern Lower California have their close relatives inhabiting Sinaloa and southern Sonora. The flora of the Cape Sierran District has forms which are closely related to species now inhabiting the highlands of central Mexico, but strangely this easterly derived flora occurs intermixed with a flora characteristic of the Californian foothills and lower mountain slopes. Although the flora of the southern sections of the peninsula is definitely allied to that of the adjacent Mexican mainland, its means of ingress is hardly obvious. The floristic mixture on the mountains in the cape region, and the faunal distribution on the peninsula as a whole, are complicating factors which make a theory for biotic origins difficult to formulate.

Before a satisfactory hypothesis can be chosen which will explain present-day distribution of life on the peninsula it is best that a brief inquiry be made into the facts of animal distribution in the area. For this purpose a study has been made of the available data on mammals (exclusive of bats), reptiles, amphibia, and gastropods. As Nelson (*Mem. Nat. Acad. Sci.*, 16:117. 1921) has pointed out, all but one of the 140 species and subspecies of land mammals known from the peninsula belong to stocks which have clearly gained the peninsula from the north and have spread over it by southward migrations. With the exception of *Oryzomys*, all the genera of peninsular mammals occur in California and in many cases the same

species occurs there as well. The nearest relative of *Oryzomys peninsulae*, which is known only from the vicinity of San José del Cabo, is a species of Sinaloa, and Nelson (Mem. Nat. Acad. Sci., 16:124. 1921) even suggests that the peninsular species is a man-transported introduction from Mazatlan. According to Schmidt (Bull. Am. Mus. Nat. Hist. 46:611. 1922) there are 138 species and subspecies of reptiles known from the peninsula and adjacent islands. With the exception of six species contained in the genera *Bipes*, *Sator*, *Ctenosaura*, and *Phyllodactylus*, and three included in *Natrix*, *Elaphe* and *Pseudemys*, all the reptiles clearly had ancestors which entered the peninsula from the north and spread southward. The six exceptions first mentioned are evidently tropical in relationship and all but *Phyllodactylus tuberculosus* are endemic. *Phyllodactylus tuberculosus* ranges widely along the west coast of tropical America. Its presence was recently discovered even in the Colorado Desert of California. Among the endemic reptiles of tropical relationships *Bipes biporus* is most interesting, it being a weak two-legged burrowing lizard belonging to a very ancient, nearly extinct family. It is restricted to the cape region and finds its nearest relation in a monotype of the Mexican tableland. *Sator* is a saurian genus of two species, known only from Cerralbo, San Diego, and Santa Cruz islands. Its closest affinities are apparently with a *Sceloporus* of the Coliman region in Mexico. *Phyllodactylus unctus* is endemic to the cape region. *Ctenosaura hemilopha* occurs in the cape region and on Cerralbo, San Esteban, and San Pedro Nolasco islands. Its relations are in southern Mexico. The scattered distribution of the species in the gulf area suggests the relic occurrence of a species once widely distributed. *Elaphe*, *Natrix* and *Pseudemys* "are widespread in North America, and their absence in the Sonoran deserts of the United States is due to absence of suitable habitat conditions." Hence it is not at all improbable that the peninsular species gained the area of Lower California in a period when climatic conditions in southwestern United States were more favorable to a wide distribution of these genera in that region. There is no particular reason for believing them to have reached the peninsula directly from the Mexican mainland. There are eight amphibians known from Lower California, of which only four are wide-

ranging, the bulk occurring only in the north-most section of the peninsula. All the species are unquestionably migrants from north of the international boundary. Definite figures regarding the gastropods are lacking, but it can be said that the most common snails in the northern sections of the peninsula and down the west coast to about Magdalena Bay, are helicoid snails of the genus *Micrarionta* which have their relations to the northward. Over the southern parts of the peninsula the snails of the genus *Bulimulus* and *Cœlocentrum* are most common, and are evidently related across the gulf in southern Sonora and Sinaloa.

From the fact presented, it is seen that the land vertebrates as a whole have gained the peninsula from the north and have since expanded to colonize the entire peninsula. On the other hand, many gastropods and plants seem to have entered the territory from across the gulf. It seems, therefore, that a recent land connection between Sonora and Lower California is impossible, for if such a connection existed, we should expect to find the southern part of the peninsula occupied, not only by easterly derived plants, but by easterly derived vertebrates as well. It is indeed strange that the modern vertebrate fauna of Sinaloa and southern Sonora is practically absent from Lower California when the modern flora of Sinaloa and Sonora is not only present, but actually dominates the most of Lower California. These facts make clear the interesting and complex problem concerned with the explanation of the origin of the peninsular biota. Our problem is to explain the obviously different origins of the peninsular flora and fauna, and to explain why the complimentary fauna and flora of the biota from which each invasion came is not represented, or is but weakly developed on the peninsula.

The cape region seems to be a very old area, and appears to have escaped complete submergence since its initial elevation early in the Tertiary. During the long periods previous to the Pliocene the cape region was separated from California by a long stretch of water, for at that time the strata of the present volcanic plateau were horizontal and still under the sea. The cape region of Tertiary times was probably a larger area than now and connected for a time with the Mexican mainland. While joined easterly to the Mexican coast, the

fauna and flora of that region gained access to the cape region. Among many other species the ancestors of the southerly-derived reptiles, the *Oryzomys*, and the heavy-seeded montane trees, such as *Pinus*, *Quercus*, and *Arbutus*, came over on the Tertiary land connection.

The Peninsula as a whole came into existence during the late Pleistocene. The tremendous uplift which made the Peninsula probably reacted to cause the subsidence of the territory now forming the trough of the gulf. Whatever land connections there may have been between the mainland and the cape region were obliterated, and the cape region assumed its present relation to the mainland and to the peninsula as a whole. At the close of the Tertiary the fauna and flora of the cape region must have been essentially Mexican, and when the opportunity was finally offered the animals and plants began to extend up the Peninsula.

For some reason the fauna and flora were subjected to a crisis during the Pleistocene, and all but a few vertebrates such as *Bipes*, *Sator*, *Phyllodactylus*, and *Oryzomys* were destroyed. Among the plants the existing representatives of the Sierra Madran flora, and possibly a number of lowland types escaped, but very likely, as with the vertebrates, most of the peinsular species of that time were destroyed. The crisis may have been brought about by a cooling of the climate or by an increase of precipitation; but whatever its cause, the change must have permitted better adapted forms to come down from the north. These forms competing with the old biota then under a disadvantage, were able to win out and finally supersede the original fauna and flora. The Sierra Madran elements of the present cape region being able to stand more rain and cold than the then existing tropical lowland forms, were no doubt able to adapt themselves to the Pleistocene crisis and afterwards find a suitable home in the high mountains where they are found today. The flora of California probably extended south to the cape during the period of climatic change, and upon its close left a few stragglers to associate with the Sierra Madran elements in the montane areas of the cape region.

As the climate gradually became what it is today, the northerly derived vertebrates were able to adapt themselves to the new conditions; for the gulf was an effective barrier to the

southern forms which might at once be better adapted to the new environment and hence able to claim the region at the expense of the northerly forms then actually inhabiting it. With the flora the conditions were different, for better means of dispersal allowed seeds of the southern forms to reach the peninsula, to compete with and finally drive from the southern sections of the territory the Californian forms then occupying it.

Winds have probably been the important agents in populating the peninsula with plants. The excessively violent winds that accompany the autumn storms can readily carry seeds, or at any rate drive flottage over the gulf for great distances. The frequency, violence, and direction of these storms, as well as the excellent opportunities offered for the picking up of seeds by the wind or for the washing into the sea of seed-carrying debris, makes them potent factors in distributing plants over the gulf area. Nelson (*Mem. Nat. Acad. Sci.* 16:96-97, 1921) gives some very illuminating data regarding the fierceness and strength of the rain and wind storms which sweep over the gulf area.

To understand insular distribution in the Gulf of California one must appreciate that the gulf area is one of great, unequal, and widespread diastrophism, and that the blocks forming the islands have been moved more or less independently of the large blocks forming the adjacent peninsula or mainland. It is a natural first assumption that the islands have been connected to the adjacent land in comparatively recent times, and that these connections are indicated by topographical alignments and shoals. This assumption, however, seems to have been correct only in a few instances. From the height of deposits on the peninsula and the comparatively low altitude at which they occur on the islands, it seems that the islands have been relatively little affected by the submergences and elevations which have left their mark on the peninsula. That modern shells are found on the peninsula at 1000 meters does not indicate that the adjacent islands even when less than 1000 meters high, were submerged, for the islands and peninsula are separated by a line of active faulting which makes the movements of the islands more or less independent of the risings and sinkings across the riff. As a corollary, depths do

not necessarily indicate a lack of land connection in the past, for the forces that heaved up the peninsula and shaped the present gulf trough could well move the small chips of land forming the islands and separate or join them to the peninsula with a minimum of effort.

The great majority of the gulf islands do not appear to have been joined to the peninsula or mainland in recent times, and as a general rule it seems that their fauna and flora must have been brought to them by wind and waves. The biota of Tiburon Island seems to indicate a comparatively recent and complete connection of that island with the adjacent mainland, the fauna and flora with slight modifications being the same as that on adjacent Sonora. The islands of San Josef and Espiritu Santo have vertebrate faunas nearly as complete as would be expected were they once connected with the peninsula, but at the same time they are lacking forms which one would naturally expect if the connection did exist. The endemic stamp which characterizes the faunas of these islands, and which especially contrasts them with Tiburon Island, probably indicates a comparatively long separation from the peninsula. Isolation and the working of some environmental factor may have eradicated the missing forms which connection with the peninsula, if it once existed, certainly would have contributed to the islands. Ceralbo Island stands in marked contrast to Espiritu Santo and San Josef islands. Whereas Ceralbo has but two mammals (*Peromyscus* and *Perognathus*) and six reptiles (*Verticaria*, *Sator*, *Ctenosaura*, *Dipsosaurus*, *Callisaurus*, *Crotalus* and *Coluber*), Espiritu Santo Island has six mammals (*Peromyscus*, *Perognathus*, *Neotoma*, *Lepus*, *Ammospermophilus*, and *Bassariscus*) and 12 reptiles (*Verticaria*, *Uta* 3 spp., *Sceloporus Cnemidophorus*, *Sauromalus*, *Phyllodactylus*, *Coluber*, *Chilomeniscus*, and *Crotalus*), and San Josef Island has six mammals (*Perognathus*, *Dipodomys*, *Neotoma*, *Sylvilagus*, *Odocoileus*, and *Bassariscus*) and 11 reptiles (*Verticaria*, *Uta*, *Sceloporus*, *Callisaurus*, *Cnemidophorus*, *Dipsosaurus*, *Phyllodactylus*, *Coluber*, and *Crotalus* 2 spp.). It seems that either San Josef and Espiritu Santo islands have been connected with the peninsula while Ceralbo have not been so connected, or that the two former have had better opportunities for having things carried to

them. It is possible also that San Josef and Espiritu Santo islands have changed but little since their isolation, whereas in the meantime Ceralbo may have developed some unfavorable conditions which have greatly reduced its original fauna. Any one or all these conditions would account for the differences between the fauna of Ceralbo and that of Espiritu Santo and San Josef islands. It seems more probable, however, that the true explanation lies in assuming that Ceralbo has not been connected, or at least as completely connected, with the peninsula as has its neighboring islands. Excluding Tiburon, San Josef, Espiritu Santo and Ceralbo islands, the remaining gulf islands have vertebrate faunas which usually consist of one or two rodents and several lizards which in most cases represent endemic species with relations on the adjacent coast. Direct land connection seems, therefore, to have been in only a few cases the means of populating the gulf islands. The faunas of the more remote islands seem to indicate a fortuitous origin. For example, Tortuga Island has a *Bulinulus*, a *Crotalus*, a *Sceloporus*, and a *Peromyscus* (?) all of which appear to be endemic. This motley fauna seems best explained as a flottage cargo, especially as the island is a volcano only recently extinct.

The flora of the gulf islands shows no tendency towards endemism. Certainly not 1% of the insular flora is endemic, and even that small percentage of endemism will probably disappear when the coast of adjacent mainland and peninsula is well explored. Endemism is not as high on the gulf islands as would be expected in a continuous region covering the same expanse of latitude. That the vertebrate fauna on the gulf islands is mainly endemic to each island, and that endemism is the great exception and by no means the rule in the flora, seems to indicate that some factor is at work with the flora which inhibits the production of insular endemisms. The lack of endemism seems best attributed to the great frequency with which peninsular or mainland seeds are brought to the islands and incipient endemism quashed.

Taking in all, it seems probable that the gulf islands have been largely populated by descendants of those animals which, clinging to shrubbery or debris, have been washed out into the gulf by some one of the sudden torrential storms. If the

flotage happens to be soon washed ashore on one of the islands, and the island is suitable to the animal's needs, these fortuitous circumstances may allow the animal to populate the new territory. Once the island has been claimed by some form, then successive attempts at populating it would be made with greater and greater difficulty due to genetical swamping and to the probable competition to which the new arrival would be subjected during the critical period in which it must adapt itself to its new home. The chances that a gravid female or that a pair of one species may be washed up coincidentally upon an island is remote; but were this a frequent happening, endemism would not be universal among the insular animals. On the other hand, plants on a given island can spring from a single seed which can be carried by wind, bird, or in the pods of some bush washed into the gulf by storm water. The chances of successful animal introductions are very few as compared with the chances of successful plant introductions, and the relative endemism in the two great phyla seems to reflect the effect of this condition.

EXPLORATION

The first botanical exploring in the gulf area was done by Thomas Coulter. Coulter was connected with a mining company and was located at Hermosillo, Sonora, for a number of months in 1829 and 1830. During this time, or later, he visited the principal cities along the west coast of Mexico. Coulter made a large collection of plants, but these were never made the subject of a special study. The data accompanying his specimens are meagre and notoriously inaccurate, for he apparently used geographic names loosely and allowed his labels to become mixed. A detailed discussion of Coulter's travels has been given by Coville (*Bot. Gaz.* 20:519, 1895).

Though not the first in the general region, the collections made by Richard Hinds and George Barclay of the British exploring ship *Sulphur*, became the basis of Bentham's "Botany of the Voyage of H. M. S. *Sulphur*." The volume mentioned contains the initial descriptive account of the flora of Lower California. The *Sulphur* cruised along the west coast of

Lower California in 1839, making stops at San Quintin, Magdalena Bay, and Cape San Lucas.

The next exploration made in the general region was that conducted by John Xantus de Vesey, who was stationed at Cape San Lucas and made botanical collections there during 1859 and 1860. The Xantus collections were studied by Asa Gray (Proc. Am. Acad. 5:153-173. 1861) who prepared an important paper upon them.

The most extended and important explorations made in the gulf area were those carried on by Edward Palmer. His earliest work in the region was done in 1869 on the coastal plains of Sonora in the region of the Yaqui River, and in the area of the Colorado River delta. In 1870 he spent two days on Carmen Island. No special paper was ever published on these collections. Palmer's important work in the gulf area began in 1887 when he spent 18 weeks at Guaymas, eight days on San Pedro Martir Island, several weeks at Mulegé, and four weeks at Los Angeles Bay. The large collection which he amassed was studied by Sereno Watson, who prepared a notable paper upon the subject (Proc. Am. Acad. 24:36-82. 1889). Palmer spent three days early in May, 1889, at Lerdo, Sonora, near the head of the gulf, and made a small collection which was written up by Vasey and Rose (Contr. U. S. Nat. Herb. 1:27-28. 1890). In 1890 Palmer spent two weeks at La Paz, and then sailing north to Santa Rosalia where he remained from February 24 to March 15 collecting about that port and the adjacent town of Santa Aguada, made brief stops at Isla Raza and San Pedro Martir Island. The 1890 collections were treated at length by Vasey and Rose (Contr. U. S. Nat. Herb. 1:63-90. 1890). The first week in March, 1890, Palmer spent in revisiting Carmen Island and then made collections upon which Rose reported in a special paper. (Contr. U. S. Nat. Herb. 1:129-134. 1892). Following his last visit to Carmen Island Palmer turned his attention to regions beyond the gulf area. Stafford (Pop. Sci. Mo. 78:341-354. 1911) has written interestingly concerning Palmer's career as a collector.

C. G. Pringle, though one of the most important collectors in other parts of Mexico, played but a minor role in the botanical exploration of the gulf area. In 1884 he collected in

northwestern Sonora, apparently working out from the mining town of Altar and down the Asuncion River valley. He is definitely known to have visited Cape Lobos during this journey. Gray and Watson described miscellaneous species from his collections, but no general account of the latter was ever written.

T. S. Brandegee has been the most thorough and important botanical explorer of the peninsula. Though he botanized throughout the length of Lower California, he collected on the gulf only at La Paz. Brandegee has written much on the flora of Lower California, his most useful papers being his "Plants from Baja California" (*Proc. Calif. Acad. Sci.* II, 2:117-216. 1889) and his "Flora of the Cape Region" (*Proc. Calif. Acad. Sci.* II, 3:108-182. 1891).

Léon Diguët, for three years an employé of the Boleo Company, landed at Santa Rosalia late in 1896 in the capacity of biological explorer for the Paris Museum of Natural History. He proceeded overland to La Paz going there by way of Mulegé, Purisima, and Comondú. After a time at La Paz he went to Todos Santos and from there to La Laguna in the high mountains. Eventually he returned to Santa Rosalia, going through La Paz, Comondú, Loreto, and Mulegé. He next went by boat to Los Angeles Bay where he spent two days. Upon his return to Santa Rosalia he proceeded northward overland to Calamujuet or beyond. At the close of this last trip, after a period of six months, he sailed for Guaymas. Going overland he proceeded southward into Sinaloa, at least to Mazatlan, and finally went to Jalisco where he spent considerable time before embarking for France. While at Santa Rosalia and La Paz, he had numerous opportunities to visit the islands in the gulf and is known to have set foot upon Tortuga, Carmen, Catalina, Espiritu Santo, and Ceralbo. Although his opportunities were great, Diguët's collections seem to be meagre and poorly supplied with data. His best collecting was in the cacti, but in that group as in others, he seemed to have gotten only the common or spectacular things. Data regarding Diguët's itinerary are to be found in the early volumes of the *Bulletin du Muséum d'Histoire Naturelle* (particularly 1:4, 28-30. 1895. and 2:78.1896).

Besides having published much on the region, J. N. Rose visited it in June, 1897, and spent about two weeks collecting about Guaymas and La Paz. He collected a second time about Guaymas in March, 1910, when he was assisted by P. C. Standley and P. G. Russell. In 1911, Rose was on the *Albatross* and spent most of April cruising in the Gulf of California. At that time he visited San José del Cabo, Ceralbo Island, Espiritu Santo Island, La Paz, San Josef Island, Santa Cruz Island, Catalina Island, Agua Verde Bay, Carmen Island, Mulegé, Concepcion Bay, San Francisquito Bay, Angel de la Guarda Island, San Esteban Island, Tiburon Island, Turner ("Seal") Island, and Guaymas. An interesting brief account of the last visit is to be found in the Journal of the New York Botanical Garden (12:263-272. 1911).

Between March, 1905, and February, 1906, E. W. Nelson and E. A. Goldman traversed the length of the peninsula and made very large biological collections. The points visited on the gulf are San Felipe Bay, Calamajuet Landing, Santa Rosalia, Mulegé, La Paz, Espiritu Santo Island, and Ceralbo Island. A large plant collection was made by Goldman (Contr. U. S. Nat. Herb. 16:309-371. 1916) who published a valuable paper upon his botanical observations. A detailed and very interesting running account of the expedition is to be found in Nelson's admirable monograph on Lower California (Mem. Nat. Acad. Sci. 16:13-48. 1921).

A notable botanical reconnaissance was made in 1904 by D. T. MacDougal (Bot. Gaz. 38:44-63. 1904) about the mouth of the Colorado River and at San Felipe Bay. In 1907 he headed an expedition to the Pinacate Mountains and the plants collected there were treated at length by Rose and Standley (Contr. U. S. Nat. Herb. 16:5-20. 1912). The only point on the gulf actually touched was Adair Bay where a small collection was made by G. Sykes.

Our knowledge of the gulf area flora has been furthered by a number of small collections. One of these was made at La Paz in 1847 by Major Rich. In 1876 T. H. Street of the U. S. Navy gathered a few odd plants in the gulf, giving as localities, Pulpito Point, Canvas Point, and Angel de la

Guarda. Walter Bryant, the ornithologist, made a small plant collection on Espiritu Santo and San Josef islands in April, 1892. In 1895 a visit was made to Tiburon Island by W. J. McGee who made a small collection of plants. W. M. Gabb traversed the peninsula in 1867 and made a scrappy collection of cacti upon which, unfortunately, many new species were based. Gabb touched the gulf only at La Paz, Loreto, and Mulegé.

For the details of the present expedition see the "General Account" by J. R. Slevin (Proc. Calif. Acad. Sci. IV, 12:55-72. 1923).

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For the approval of him as official collector and for permitting him to work over the botanical collection, the writer is indebted to Dr. Barton Warren Evermann, Director of the Museum of the California Academy of Sciences. The report was prepared in its greatest part while studying at the University of California. Dr. W. A. Setchell of that institution has been particularly helpful in his suggestions and in his willingness to obtain critical specimens and literature. Mr. T. S. Brandegee has been of inestimable assistance, his knowledge of the peninsular flora helping over many difficulties, and his large and important collection, now a part of the University of California Herbarium, supplying the basis for many critical comparisons. Dr. H. M. Hall of the Carnegie Institution of Washington has contributed many valued suggestions and has assumed the responsibility for the determinations in *Atriplex*.

Dr. J. N. Rose of the United States National Herbarium has given invaluable help with the cacti; and Mr. E. P. Killip of the same institution has contributed critical determinations of the Passifloræ. Dr. B. L. Robinson of the Gray Herbarium and Dr. S. F. Blake of the United States Department of Agriculture, have both supplied valued opinions concerning the Compositæ. The greatest debt, however, is to Miss Alice Eastwood, Curator, Department of Botany, California Academy of Sciences, whom the writer thanks for his nomination as expedition botanist and for the material assistance which made the preparation of this paper possible.

INTRODUCTION TO THE CATALOGUE

The following catalogue enumerates the species and varieties of vascular plants collected on the expedition. A serious attempt has been made, however, to make the catalogue something more than a mere list of names and localities, for under each heading there has been an attempt to give original data regarding the habits, habitat, and distribution of each of the forms in the gulf area. For the sake of definiteness, all the expedition collections have been mentioned, the collection numbers being consistently cited in parentheses following the mention of the proper localities. The carefully selected and very full first set of exsiccata, as well as the types of all new species described herein, are to be found in the Herbarium of the California Academy of Sciences at San Francisco, California.

With the view of helping future workers in the area it has been thought best to give taxonomic bibliography. Complete bibliography has been given of those species with few synonyms and of those species which are confined to the gulf area, but of widely ranging species with complicated synonymy only a few of the important items have been listed. Type localities have been listed, and, with the western species particularly, it has been the plan to state the locality as precisely as data will allow regardless of the original wording.

The nomenclature is according to the International Rules. The attitude towards species is conservative. It has been the

rule not to propose any species for which several good quantitative diagnostic characters could not be enumerated. The flora of Lower California has been described without such a rule, for as in other regions in an early stage of botanical exploration, the flora has been approached with a keenly, not to say recklessly, analytic attitude, and species, many of them very critical ones, have been based on meagre material and without comparison or indication of crucial characters. It is not surprising, therefore, that it has been frequently necessary to reevaluate described species, for many have stood, and no doubt others still stand, only because the proper comparisons have never been made, or because an adequate series has never been collected. There are numerous forms on the peninsula which bear binomials although they are merely peninsular strains of widely ranging species. Due to its length and span of latitude, the peninsula has been particularly fitted for the development of geographic races. In dealing with geographic forms, which are very numerous in the area, the principle so successfully applied by mammalogists and ornithologists has been accepted, and geographic races have been given subordinate rank under the species. Forms with geographically correlated developments have been considered worthy of a name, even when the development is rather trivial in character.

The major part of the work on this paper was done in the University of California Herbarium where access was had to the types and rich peninsular collections of Mr. Brandegee. Subsequent to the months of study in California the manuscript was thoroughly overhauled at the United States National Herbarium and at the Gray Herbarium. All the collections rich in peninsular material have been consulted, and the greatest proportion of the types of those species first described from Lower California and adjacent areas have been studied.

CATALOGUE OF SPECIES COLLECTED

I. POLYPODIACEÆ

1. *Adiantum capillus-veneris* L.

Adiantum capillus-veneris L., Sp. Pl. 1096. 1753.—*Type locality*: Europe.

Very common in the large cañon back of Escondido Bay (4112) where it lines all the seeps down to about 300 m. altitude.

2. *Notholæna californica* D. C. Eaton

Notholæna californica D. C. Eaton, Bull. Torr. Cl. 10:27. 1883.—*Type locality*: San Diego County, California.

The most abundant fern in the gulf area, though not common. It was collected at Los Angeles Bay (3460), Santa Cruz Island (3915, 3916), Espiritu Santo Island (3998, 3999, 4006, 4007), Ceralbo Island (4032), and La Paz (4020). It frequents rocky slopes, growing under or about rocks. On the islands, yellow and white forms were found growing together and appearing to agree in all respects save the color of the powder on their surfaces.

3. *Notholæna lemmoni* D. C. Eaton

Notholæna lemmoni D. C. Eaton, Bull. Torr. Cl. 7:63. 1880.—*Type locality*: Santa Catalina Mountains, Arizona.

Seen at La Paz (4019), Escondido Bay, and San Pedro Bay (4336). At San Pedro Bay it was locally abundant on a rocky hillside, but at the other stations only a few odd plants were noted growing in rocky places.

4. *Pityrogramma triangularis* var. *maxoni* Weatherby

Pityrogramma triangularis var. *maxoni* Weatherby, Rhodora 22:119. 1920.—*Type locality*: Rincon Mountains, Arizona.

Seen only on Tortuga Island (4185) where it was very common about rocks inside the old crater.

5. *Thelypteris augescens* var. *puberula* (Feé) Munz
& Johnston, n. comb.

Aspidium puberulum Feé, Mem. Soc. Nat. Strasburgh 6:40. 1865.—*Dryopteris puberulum* Baker, Synop. Fil. 495. 1874.—*Dryopteris feei* Chr., Index Fil. 264. 1905.—*Type locality*: Huatusco, Vera Cruz.

Very common and conspicuous in wet, sheltered places in the large cañon in the Sierra Giganta back of Escondido Bay (4117, 4118). This fern grows very rankly at altitudes above 400 m., frequently becoming 15 dm. high.

II. GNETACEÆ

6. *Ephedra peninsularis* Johnston

Ephedra peninsularis Johnston, Univ. Calif. Pub. Bot. 7:437. 1922.—*Type locality*: Magdalena Island.

Seen only on Coronados Island (3757) where a single plant was found growing among the rocks of a broken-up lava flow. The plant was staminate and formed a very intricately branched flat-topped mass 7 dm. high and 18 dm. broad. The species is doubtfully distinct from *E. nevadensis* Wats.

III. TYPHACEÆ

7. *Typha angustifolia* L.

Typha angustifolia L., Sp. Pl. 971. 1753.—*Type locality*: Europe.

A small colony of this species grew in wet sand at 400 m. altitude in the large cañon back of Escondido Bay (4116). What is probably the same species was observed in a sterile condition at Mulegé where it formed large clumps about the reservoir.

IV. POTAMOGETONACEÆ

8. *Ruppia maritima* L.

Ruppia maritima L., Sp. Pl. 127. 1753.—*Type locality*: Europe.

Collected from an irrigation ditch at Mulegé (3672) and from the bay at La Paz (4012). It grew abundantly in one

of the pools of the abandoned oyster-culture plant on Espiritu Santo Island. The material from Lower California seems to have the beak on the fruit better developed than the material from California and probably is referable to the variety *rostrata* Agardh. (cf. *Rhodora* 16:125. 1914).

9. *Zannichellia palustris* L.

Zannichellia palustris L., Sp. Pl. 969. 1753.—*Type locality*: Europe.

Abundant in a warm still pool near the margin of the reservoir at Mulegé (3671). Brandegee has collections from Comondú.

V. NAJADACEÆ

10. *Najas guadalupensis* (Spreng.) Morong

Najas guadalupensis Morong, Mem. Torr. Bot. Cl. 3:2. 1893.—*Caulinia guadalupensis* Spreng., Syst. 1:20. 1825.—*Type locality*: Isle of Guadeloupe, West Indies.

Occurring in great abundance in a spring-fed pool on the ranch at San Evaristo Bay (4093). Another species of this genus, *N. marjina* L., is known from Mulegé *Palmer* (type collection of var. *mexicana* Rendle, Trans. Linn. Soc. II, 5:398. 1899) and San Gregorio *Brandegee*.

VI. GRAMINEÆ

11. *Aristida adscensionis* L.

Aristida adscensionis L. Sp. Pl. 82. 1753.—*Aristida bromoides* H.B.K., Nov. Gen. et Sp. 1:110. 1816—*Type locality*: Ascension Island.

Collected on San Esteban (3203) and Angel de la Guarda (4215) islands. The latter collection has the lateral awns erect and about a fourth as long as the middle awn.

12. *Aristida californica* Thurb.

Aristida californica Thurb., Bot. Calif. 2:289. 1880.—*Aristida californica* var. *fugitiva* Vasey, Contr. U. S. Nat. Herb. 3:49. 1892.—*Type locality*: Colorado Desert, California.

Collected on a rocky hillside on Angel de la Guarda Island (4218) and on the sandy plain back of La Paz (3054).

13. *Bouteloua barbata* Lag.

Bouteloua barbata Lag., Var. Cienc. 2^a:141. 1805.—*Chondrosium polystachyum* Benth., Bot. Sulph. 56. 1844.—*Bouteloua polystachyum* Torr., Pacif. R. R. Rep. 5:366. t. 10. 1857.—*Type locality*: Mexico.

Several large colonies of this species were found with *Atriplex* on the guano-covered flats of Patos Island (3245).

14. *Bouteloua repens* (H.B.K.) Scrib & Merr.

Bouteloua repens Scrib. & Merr., U. S. Dep. Agr. Div. Agrost. Bull. 24:26. 1891.—*Dinebra repens* H.B.K., Nov. Gen. et Sp. 1:172, t. 52. 1816.—*Type locality*: Near Acaapulco, Guerrero.

A single plant of this grass was found growing with *Panicum geminatum* in a moist rock-crevice on a cañon floor at the head of San Carlos Bay (4351).

15. *Bouteloua rothrockii* Vasey

Bouteloua rothrockii Vasey, Contr. U. S. Nat. Herb. 1:268. 1893.—*Type locality*: Cottonwood, Arizona.

A specimen from a dry rocky hillside back of Guaymas (3087) is doubtfully referred here. It is low, under 15 cm., and has ascending culms, but otherwise seems to be typical.

16. *Cenchrus pauciflorus* Benth.

Cenchrus pauciflorus Benth., Bot. Sulph. 56. 1844.—*Type locality*: Magdalena Bay, Lower California.

Common in cultivated fields at Mulegé (3682).

17. *Cenchrus palmeri* Vasey

Cenchrus palmeri Vasey in Brandg., Proc. Calif. Acad. Sci. II, 2:211. 1889.—*Type locality*: Guaymas, Sonora.

A common and characteristic grass in sandy soil throughout most of the gulf area. Although collections were made only at San Francisquito Bay (3560) and on Tiburon Island (3251), the plant being mainly dried up, the characteristic burs were recognized at San Luis Gonzales, Los Angeles, Las Animas, and San Nicolas bays; and on Angel de la Guarda, Carmen, Monserrate, San Josef, San Francisco, and Ceralbo islands. When present the plant was common, for the vicious burs were ubiquitous, and heedless kneeling on the ground nearly always produced specimens.

18. *Chloris virgata* Swartz

Chloris virgata Swartz, Fl. Ind. Occ. 1:203. 1797.—*Chloris elegans* H.B.K., Nov. Gen. et Sp. 1:166, t. 49. 1816.—*Type locality*: Antigua, West Indies.

Several plants of this species grew from a crack in the lava on a gulch bottom on Tortuga Island (3610).

19. *Distichlis palmeri* (Vasey) Fassett, n. comb.

Uniola palmeri Vasey, Gard. & For. 2:401, f. 124. 1889.—*Type locality*: Horseshoe Bend 12-15 miles above the mouth of the Colorado River, Sonora.

Seen only at Las Animas Bay (3491) where it was common along the foot of a bank at the edge of a tide-flat. It is a very coarse rhizomatous grass the very brittle stems of which reach a height of 12 dm. when partially supported by brush. The more or less convolute leaves are pungent and can prick rather painfully. The collection seems to be the only one made on the peninsula proper and to set the southern-most known locality for the species.

Due to a technical character of doubtful value, the occurrence of one or two sterile lemmas in the pistillate spikelet, this species was originally referred to *Uniola*, a genus in which it is utterly strange as to habit. The gross aspect of *Uniola palmeri* is that of a rankly growing *Distichlis*. According to

Holm (Bot. Gaz. 41:275. 1891) the leaf-anatomy is also suggestive of that genus. Mr. N. C. Fassett has also observed that it agrees with *Distichlis* in its dioecious habit, and sexually dimorphic inflorescences and spikelets. A complete discussion of the situation will soon be published by Mr. Fassett in his taxonomic study of *Distichlis*.

20. *Gouinia brandegei* (Vasey) Hitchc.

Gouinia brandegei Hitchc., U. S. Dept. Agri., Bur. Pl. Ind. Bull. 33:21. 1903.—*Diplachne brandegei* Vasey, Proc. Calif. Acad. Sci. II, 2:213. 1889.—*Type locality*: Magdalena Island, Lower California.

A coarse tufted grass becoming 8 dm. high which was rare on rocky benches on San Esteban Island (4399). It has been collected on Carmen Island by Palmer.

21. *Heteropogon contortus* (L.) Beauv.

Heteropogon contortus Beauv. in R. & S. Syst. 2:836. 1817.—*Andropogon contortus* L., Sp. Pl. 1045. 1753.—*Type locality*: India.

Seen only on South San Lorenzo (4199) and San Esteban (3208) islands where it is frequent on rocky cañon floors.

22. *Imperata hookeri* Rupr.

Imperata hookeri Rupr. in Anders., Öfv. Vet. Akad. Förh. 12:160. 1855.—*Type locality*: Texas.

Several colonies were found on a stream-side in the Sierra Giganta back of Escondido Bay (4123). It grew at about 500 m. altitude. The plant does not appear to have been previously collected so far south on the peninsula; in fact, the only peninsular record (Contr. U. S. Nat. Herb. 17:197. 1913) is from the extreme northern part.

23. *Jouvea pilosa* (Presl) Scrib.

Jouvea pilosa Scrib., Bull. Torr. Cl. 23:143. 1896.—*Brizopyrum pilosum* Presl, Rel. Haenk. 1:280. 1830.—*Type locality*: Acapulco, Guerrero.

A large colony of this dicecious grass grows on Carmen Island (3835) on the dunes along the shore of San Francisco Bay. This station extends the known limits of the species some 120 km. to the northward, the previous known stations in the gulf area being San José del Cabo, La Paz, and San Josef Island.

24. *Leptochloa uninervia* (Presl) Hitchc. & Chase

Leptochloa uninervia Hitchc. & Chase, Contr. U. S. Nat. Herb. 18:383. 1917.—*Megastachya uninervia* Presl, Rel. Haenk. 1:283. 1830.—*Leptochloa imbricata* Thurb. in Wats., Bot. Calif. 2:293. 1880.—*Type locality*: Mexico.

A few plants were found on the bank of an irrigation ditch at Mulegé (3683).

25. *Monanthochloë littoralis* Engelm.

Monanthochloë littoralis Engelm., Trans. Acad. St. Louis 1:436. 1859.—*Type locality*: Texas.

Collected only from about the lagoon on Raza Island (3219), but observed in similar situations at Tepoca Bay and at the Lagoon on Angel de la Guarda Island. The Pacific Coast material of the species has a sharp cusp terminating the leaves whereas that from Texas commonly has blunt leaf-tips.

26. *Muhlenbergia microsperma* (DC.) Kunth

Muhlenbergia microsperma Kunth, Rev. Gram. 1:64. 1829.—*Trichochloa microsperma* DC., Cat. Hort. Monsp. 151. 1813.—*Type locality*: Mexico.

Observed only on Tortuga and San Pedro Martir (4398) islands. At the latter station it is the only endogen and is very abundant.

27. *Paspalum distichum* L.

Paspalum distichum L., Syst. Nat. ed. 10, 855. 1759.—*Type locality*: Not given.

Very common on the saturated meadow-lands surrounding the reservoir at Mulegé (3668).

28. *Panicum geminatum* Forsk.

Panicum geminatum Forsk., Fl. Aegypt. 18. 1775.—*Type locality*: Egypt.

Frequent in moist rock-crevices in a cañon near San Carlos Bay (4350).

29. *Setaria macrostachya* H.B.K.

Setaria macrostachya H.B.K., Nov. Gen. et Sp. 1:110. 1816.—*Chaetochloa macrostachya* Scrib. & Merr., U. S. Dept. Agri. Div. Agrost. Bull. 21:29. 1900.—*Chaetochloa rigida* Scrib. & Merr., U. S. Dept. Agri. Div. Agrost. Bull. 21:30. 1900.—*Type locality*: Guanajuato, Mexico.

Extremely abundant on north-facing slopes on San Pedro Nolasco Island (4397) where it makes some hillsides appear as hayfields. A few small colonies were seen on San Esteban (4396) and Tortuga islands growing on cañon bottoms. All the material collected is in very advanced maturity.

30. *Sporobolus virginicus* (L.) Kunth

Sporobolus virginicus Kunth, Rev. Gram. 1:67. 1829.—*Agrostis virginicus* L. Sp. Pl. 63. 1753.—*Sporobolus pungens* Kunth, Rev. Gram. 1:68. 1829.—*Type locality*: "Virginia."

Forming a large colony on a sandy beach near the south end of Monserrate Island (3869). The previous collections on the Pacific Coast are from Guaymas, San Francisquito Bay, Santa Margarita Island, and Cedros Island.

31. *Triodia pulchella* H.B.K.

Triodia pulchella H.B.K., Nov. Gen. et Sp. 1:155, t. 47. 1816.—*Tricuspis pulchella* Torr. Pacif. R. R. Rep. 4:156. 1857.—*Tridens pulchellus* Hitchc. in Jepson, Fl. Calif. 1:141. 1912.—*Type locality*: Southern Mexico.

Frequent on gravelly benches in a cañon on South San Lorenzo Island (4413).

VII. CYPERACEÆ

32. *Cyperus dioicus*, n. sp.

Perennial from a rootstock; leaves rather firm, flat, smooth, lower ones 10-25 cm. long and 4-8 mm. wide; leaves of involucre usually reflexed, 1-3, 6-10 cm. long, 25 mm. wide, the longest much surpassing the inflorescence; culms slender, few, smooth, obtusely triangular, 2.5 mm. thick, 6-12 dm. long, bending over and allowing the viviparous plants which are produced at the base of the inflorescence to strike root; umbels of 3-6 usually compound rays, longest primary ray about 3 cm. long; inflorescence globose, 3-8 cm. broad, dense to open according to crowding of spikelets; spikelets usually numerous, 6-20 mm. long, 1.5-3 mm. wide, 18-50-flowered, strongly flattened; scales closely imbricate, reddish-brown with a light-colored keel and margin, broadly ovate, mucronate, 3-nerved, glabrous, keel serrulate near apex; rachis narrowly winged; flowers diœcious; stamens 3, persisting after dehiscence as protruding ligulate scarious appendages; mature anther linear, acuminate, 1-2 mm. long, about 0.12 mm. wide; filaments about 0.5 mm. long; style trifid, nearly 3 mm. long, exceeding the glumes, lobes pubescent and exceeding the undivided portion; achenes 0.66 mm. long, 1/3-1/4 as long as the subtending scale, nearly white, ovate, mucronate, 3-angled.

Type: No. 1277, Herb. Calif. Acad. Sci., collected by I. M. Johnston (No. 4145), about June 17, 1921, a moist area at **Agua Grande, Carmen Island, Gulf of California.**

A very remarkable species, most nearly related to *C. canus* Presl, and to a species here questionably called *C. mexicana* Liebm. (*Pringle 6044* and *J. D. Smith 2229*, in Gray Herb.) *Cyperus dioicus* is quite distinct from *canus* and *mexicanus*, differing in many inconspicuous details and in such conspicuous and important features as size and shape of inflorescence, in the number, length, and direction of stem leaves, in the direction, length, and size of culms, and notably in its viviparous habit. Though very different in general appearance, the three species are quite similar in spikelet details, all being diœcious, all having similarly shaped, closely appressed scales which are serrulate near the apex, all having the same peculiar stamens composed of short filaments and very long anthers,

and all having similar pistils. The spikelet details, especially staminal characters, show relationship with the African *C. alternifolius* and its allies of the section Textiles, but the presence of basal leaves in *dioicus* is atypical in that section. Most representatives of the section Textiles have numerous stem leaves, whereas *dioicus* has but few of them. In other than its dioecious habit and large stamens, it is remarkably like *C. dentatus* of the section Haspani, having the spikelets of similar shape and color, achenes of similar size and color, similarly distributed and equally abundant leaves, and, finally, a similar viviparous habit.

The plant is particularly interesting because of its agamic reproduction. Every stem produces just above the involucreal leaves several buds which early grow into vigorous leafy young plants, and which commonly crowd or frequently develop at the expense of the inflorescence. The culm averages just under a meter in length, slender, and at best, hardly capable of erect growth, usually becomes top heavy, due to the inflorescence and viviparous plants, and arches over with the flower cluster touching the ground. The bud-grown plants strike root very readily once they come in contact with the soil, and at once repeat the process by developing their culms which are frequently near flowering before they reach the ground. A vigorous colony of this *Cyperus* presents a mass of arched stems which trip one up much as does *Eleocharis rostellata*.

Pistillate specimens were collected on Carmen Island (4145) and staminate ones in the cañon back of Escondido Bay (4124). In the Brandege collection there are six sheets of this new species, one collected by Purpus (7575) at Cañon San Pablo, and five gathered by Brandege at San José del Cabo, Corral de Piedra, Sierra de la Laguna, and San Raimond Creek. No attempt seems to have been made to determine the specimens. The plant is evidently typical of the southern half of the peninsula ranging from San Pablo south to the cape.

33. *Cyperus ferax* Rich.

Cyperus ferax Rich., Act. Soc. Hist. Nat. Paris 1:106. 1792.—*Cyperus speciosa* Vahl, Enum. 2:364. 1806.—*Type locality*: Cayenne.

A few scattered colonies were found growing along seeps in the cañons about San Pedro Bay (4305). The plant grows in tufts of 1-6 stems. On the peninsula it has been collected by Palmer at Mulegé and by Brandegee at Comondú, Sierra de San Francisco, and San José del Cabo.

34. *Cyperus lævigatus* L.

Cyperus lævigatus L. Mant. 2:179. 1771.—*Type locality*: Cape of Good Hope.

Forming dense sods on the boggy areas about the numerous springs at Palm Tree Wells, Los Angeles Bay (3437). Other collections have been made in Lower California at Calamujnet (a very robust form), Los Angeles Bay, and Mulegé.

35. *Eleocharis caribæa* (Rottb.) Blake

Eleocharis caribæa Blake, *Rhodora* 20:24. 1918.—*Scirpus caribæus* Rottb., *Descr. Pl. Rar. Progr.* 24. 1772.—*Eleocharis capitata* of authors.—*Type locality*: "insula Caribæa St. Crucis."

Locally common in moist gypsum soil on San Marcos Island (3634), and in a sweetwater bog at San Evaristo Bay (4091). Brandegee has specimens from Corral de Piedra, San Gregorio, and San José del Cabo.

36. *Scirpus americanus* Pers.

Scirpus americanus Pers., *Synop.* 1:68. 1805.—*Scirpus pungens* Vahl, *Enum.* 2:255. 1806.—*Type locality*: South Carolina.

Collected only at Los Angeles Bay (3431) where it forms a little sod by one of the springs of the Palm Tree Wells. Noted also at Mulegé. Brandegee has it from San José del Cabo and San Fernando.

37. *Scirpus olneyi* Gray

Scirpus olneyi Gray, *Bost. Jour. Nat. Hist.* 5:238. 1845.—*Type locality*: Seekonk River, Rhode Island.

Growing about one of the water holes at the Palm Tree Wells at Los Angeles Bay (3448) and about the reservoir at Mulegé. Brandegee has it from San José del Cabo.

VIII. PALMÆ

38. *Glaucothea armata* (Wats.) Cook

Glaucothea armata Cook, Jour. Wash. Acad. Sci. 5:236. 1915.—*Brahea armata* Wats., Proc. Am. Acad. 11:146. 1876.—*Erythea armata* Wats., Bot. Calif. 2:212. 1880.—*Type locality*: Cantillas Cañon, Lower California.

Palms of this species are very common in a large cañon (called Palm Cañon) on the east side of Angel de la Guarda Island (3407, 3408, 3423). The plants are scattered up the dry gravelly bed of the cañon and become 8 m. high when growing in sheltered places. The palm was again seen in a wild state on the Sonoran coast at San Pedro (4340) and San Carlos (4349) bays where they were associated with the more abundant *Sabal uresana*. They grew 6-10 m. high and differed from the Sabal in their preference of cañon bottoms to cañon sides. Cultivated trees were observed at Los Angeles Bay, Mulegé, and Guaymas. The species seems to affect gravelly washes and cañon beds. It appears to be self-trimmed, and develops scarcely buttressed trunks which are about 3-4 dm. broad a meter above the ground. Flowering begins when the trunk is less than 2 m. high. The inflorescence exceeds the leaves and becomes 3-4 m. long. The mesocarp of the ripe fruit has a pleasant date-like flavor.

Cook considers *Glaucothea armata* to be generically distinct from the Guadalupe Island, *Erythea edulis* Wats. With this we are inclined to agree. When *Glaucothea* was proposed, however, Cook failed to appreciate that several other species (i.e. *Erythea brandegei*, *E. elegans*, and *E. aculeata*) were so close to *armata* that their generic relations to that species are indubitable, and that when these species are considered the white waxy coat present in *armata* and emphasized in the generic name, ceases to be of generic value. Cook made several statements which need correcting; e.g., in *armata* the leaves do not have a bowed midrib, the ligule frequently does have a tomentose cushion, and the inflorescence is not erect but horizontal or reflexed; furthermore all the plants seen had trunks as slender as, or even more slender than, *Erythea edulis*, they flowered as young, and had similarly colored flowers.

The generic differences between *Erythea* and *Glaucothea* reside in developments of petiole and inflorescence. In *Erythea* the petiole becomes reflexed by bending near the point of attachment, tears loose from the sheath, and thereby exposes most of its length. In *Glaucothea* the petiole remains attached to the sheath, becoming reflexed by a bend a decimeter or more above the point of attachment, hence fails to disclose a goodly portion of its length, and so appears shorter. In *Erythea* the inflorescence has stout branches, is rather dense, and is evidently shorter than the leaves; it has spathes subtending all the primary branches as well as having (usually) two empty ones on the basal portion of the flowering branch. *Glaucothea* has a somewhat more specialized inflorescence which differs in elongation, slenderness, and reduction of parts; the flowering branch extending far beyond the leaves and the four or five lower sheaths being flowerless. The terminal branch of the inflorescence is particularly elongated, appearing as the spatheless elongation of the flowering branch.

The San Carlos Bay collection is referable to *E. armata* var. *microcarpa* Becc. (Webbia 2:136. 1907) but does not seem to differ from the Angel de la Guarda Island collections in other than small size of fruit. It is doubtful whether size of fruit is significant, but an effort should be made to see whether or not it is geographically correlated.

39. *Glaucothea brandegeei* (Purpus), n. comb.

Erythea brandegeei Purpus, *Gartenflora* 52:11, f. 1-2. 1903.
—*Type locality*: Mountains back of San José del Cabo, Lower California.

Seen in a wild state only in the deep cañon in the Sierra Giganta back of Escondido Bay (4107) where it is very common down to about 350 m. altitude. It grows along the stream bed or in sheltered recesses on the mountain side and may become 15-22 m. high although the common height is only about 10 m. The trunk is apparently self-trimmed. This new station extends the known range of the species some distance to the northward, the only previously known stations being in the cape region. The palm found growing with *Phœnix* about the old water hole on Catalina Island (4105) is

probably this species, but it is highly improbable that the species is native on the island.

This palm is nearest to *G. armata* and perhaps eventually will be found to intergrade with it. The most apparent difference between the two species is in the foliage. *Glaucoschea armata* has the fronds heavily glaucous on both surfaces, whereas *G. brandegeei* has the upper surface green or at least greener than the lower surface, which is more or less glaucous. Purpus suggests that *brandegeei* has leaves of thinner texture, but, though this seems to be true in the young fronds, the single available mature frond of *brandegeei*, that from near San José del Cabo, is an exact duplicate, in all but its green upper surface, of the fronds of typical *armata*. The thinner leaves and the greater height of growth in *brandegeei* may be due to the comparatively moister and less arid condition in which it grows as contrasted with *armata*.

The fruit of *G. brandegeei* needs study. Purpus has given a figure (f. 2) which shows the peculiar stipe-like process found on the fruit in the type collection. Mature fruit of *armata* does not show the process developed to such a marked degree. The fruit with the type of the Sinaloan *Glaucoschea aculeata*, n. comb. (*Erythea aculeata* Brandg.) lacks the stipe-like process and, though of the same size as the fruit of *brandegeei* figured by Purpus, is larger than the fruit in isotype material of *brandegeei*. *Glaucoschea elegans*, n. comb. (*Erythea elegans* Becc.) is another closely related species. It is known only from Sonora and is characterized by its pear-shaped fruit.

40. *Sabal uresana* Trel.

Sabal uresana Trel., Rep. Mo. Bot. Gard. 12:79, t. 36-37. 1901.—*Inodes uresana* Cook, Bull. Torr. Cl. 28:534. 1901.—*Inodes roseana* Cook, Bull. Torr. Cl. 28:534. 1901.—*Sabal roseana* Becc., Webbia 2:83. 1907.—*Type locality*: A few miles north of Ures, Sonora.

Growing in great abundance in the vicinity of San Pedro Bay where it forms forests in the cañons and on the mountain sides near the gulf shore. Smaller colonies also occur at San Carlos Bay (4345). At both stations the plant grows with *Glaucoschea armata*, but greatly exceeds that species in number

of individuals. Cultivated plants occur on the plaza at Guaymas. The species is most at home on broad gravelly cañon floors but is also frequent on the hillsides. At San Pedro Bay scattered trees grow even on the cliffs that arise from the gulf shore. Immense groves occur near the gulf a few kilometers south of San Pedro Bay, but no visit was made to them.

The tree commonly grows about 12 m. high with a self-trimmed, clear trunk about 3 dm. in diameter. The spadix is paniculate, ascending, and about the length of the fronds or frequently even exceeding them, due to the drooping frond segments. The fronds are slightly glaucous, but the petioles are quite so, especially above. The average leaf-blade has a span of about 19 dm. and a length of about 15 dm., but some large fronds are 20 dm. broad and 17 dm. long. The segments of the frond are drooping and flap in the breeze; near the center of the frond they are cut $1/2$ - $3/5$ way to base but near the margins the cutting almost reaches the ligule. The petioles average about 18 dm. in length, though some 25 dm. long were noted. The base of the petiole has a flare of over 25 cm. but the width of the middle segments is only about 4 cm. The dried fruit is strongly depressed, brown in color, and averages about 15 mm. in width and 12 mm. in thickness. The seeds are mahogany in color, depressed rounded, about 12 mm. broad and 7 mm. high. The surface is usually smooth or finely rugose, though a few seeds have the coarse reticulate rugosities illustrated by Trelease. The embryo is lateral, lying horizontally or placed at an angle as sharp as 40° ; its location is marked by a small circular impression on the testa. The branchlets of the inflorescence are not spindle-shaped, but unthickened and 1-2 mm. in diameter.

The determination of this palm is difficult as it is intermediate between *S. urensana* and *S. roseana*. The two species have been distinguished by shape of spadix branchlets, size and form of tree, position of embryo, and surface of seeds. Before the shape of spadix branchlets can be used, it will be necessary to demonstrate by field observations that the development in the type of *urensana* is not an unimportant individual variation. Beccari (Webbia 2:76. 1907) has shown that the embryo differences between the two species are illusionary, while the author's observations reveal that the embryo position

is too variable for a specific character. In the San Carlos Bay collections the seeds vary from smooth to strongly reticulate, and so the use of that character is impossible. It seems as though the surface of the seeds must be affected by differences in maturing. *Sabal roseana* is supposed to have larger leaves and to be a taller and more slender tree than *S. ursana*. The San Pedro Bay and San Carlos Bay plants have these latter characters of *roseana* save that the trunk is as stout as given for *ursana*. It seems that *roseana* should stand as a southern non-glaucous form of *ursana* and should be called **Sabal ursana** var. **roseana**, n. comb. With *roseana* thus disposed of, the present glaucous Sonoran plant would be called typical *S. ursana*.

IX. LEMNACEÆ

41. *Lemna cyclostasa* (Ell.) Schleid.

Lemna cyclostasa Schleid., Linnæa 13:390. 1839.—*Lemna minor* var. *cyclostasa* Ell., Bot. S. C. and Ga. 2:518. 1824.—*Type locality*: Beaufort, South Carolina.

Growing on a still pool back of the Typha clumps about the reservoir at Mulegé (3701). Brandegee has collected the same thing in the Sierra de San Francisquito of the cape region.

X. BROMELIACEÆ

42. *Hectia pedicellata* Wats.

Hectia pedicellata Wats., Proc. Am. Acad. 26:155. 1891.—*Hectia montana* Brandg., Erythea 7:9. 1899.—*Type locality*: Guadalajara, Jalisco.

Forming dense colonies on rock-ledges in the cañons about San Pedro Bay (4314) and above 300 m. altitude in the Sierra Giganta back of Escondido Bay (4106).

XI. COMMELINACEÆ

43. *Tradescantia heterophylla* Brandg.

Tradescantia heterophylla Brandg., Univ. Calif. Pub. Bot. 10:181. 1922.—*Type locality*: Sierra El Taste, Lower California.

A plant which, with little doubt, represents this species, was locally common in the crevices of a basalt ledge on a sheltered bend in a gorge-like constriction in a ravine at the isthmus on Espiritu Santo Island (3987). The plant has a cluster of fleshy, linear roots which grow wedged into crevices, and a slender stem 3-4 dm. long which hangs down loosely from them. Only crisped stems were found but living roots were sent to Dr. Rose at the National Museum. Growing with the *Tradescantia* were *Dudleya albiflora* and a lactiferous *Mammillaria*, neither of which was seen elsewhere.

XII. JUNCACEÆ

44. *Juncus balticus* var. *mexicanus* (Willd.) Kuntze

Juncus balticus var. *mexicanus* Kuntze, Rev. Gen. 3²:320. 1898.—*Juncus mexicanus* Willd. in R. & S., Syst. 7:178. 1829.—*Juncus balticus* f. *mexicanus* Parish, Muhl. 6:119. 1910.—*Type locality*: Mexico.

Common about the water holes at Los Angeles Bay (3435).

XIII. LILIACEÆ

45. *Yucca valida* Brandg.

Yucca valida Brandg., Proc. Calif. Acad. Sci. II, 2:208, t. 11. 1889.—*Type locality*: San Gregorio, Lower California.

Seen only at San Francisquito Bay (3547) where a few large trees grow scattered over the sandy plain heading the bay. The plants were 6 m. high and composed of 1-9 ascending trunks which were loosely branched above. The inflorescence is erect and 3-6 dm. long.

XIV. AMARYLLIDACEÆ

46. *Agave deserti* Engelm.

Agave deserti Engelm., Trans. Acad. St. Louis 3:310. 1875.—*Agave pringlei* Engelm. in Baker, Handb. Amaryll. 182. 1888.—*Agave dentiens* Trel., Rep. Mo. Bot. Gard. 22:51, t. 38-40. 1912.—*Agave consociata* Trel., Rep. Mo. Bot. Gard. 22:53, t. 43. 1912.—*Agave nelsoni* Trel., Rep. Mo. Bot. Gard. 22:61, t. 65-67. 1912.—*Type locality*: San Felipe, California.

Collections referable to this species were collected on Angel de la Guarda Island (3405a-g), San Esteban Island (3194), Los Angeles Bay (3487, 3489), and San Marcos Island (3649, 3650). At all these stations it grew in colonies on hillsides. This is the thickish-leaved, surculose, acaulescent agave that is frequent over northern Lower California.

Considerable time was spent at Palm Cañon on Angel de la Guarda studying the variation in one large colony of this species. It was found that the common leaf-shape was acutely triangular with the blade 10-11 cm. wide at the base and gradually tapering to the point. The leaf-margin was usually unarmed or with an occasional weak tooth (3405c). The leaves varied from dagger-shaped (3405d,g) and only 6-8 cm. wide at the base by 4-6 dm. long, to definitely triangular (3405c), 10-11 cm. wide at the base, and tapering to the point 3 dm. away. All became smaller as the tip was approached, but some tapered evenly from the base (3405c,d,f) whereas others were abruptly contracted above the base (3405a,b,e). The margins vary from entirely naked (3405e) to armed with friable triangular teeth 2-3 mm. long and 5-8 mm. apart. Photographs of the colony mentioned are so similar to one (Rep. Mo. Bot. Gard. 22: t. 41. 1912) of *A. deserti* taken at its type locality that, to all appearances, they might represent different views of the same colony.

On San Esteban Island the plant is common in small colonies on the scorïæ-covered hillsides. The inflorescence becomes 6 m. high. Though prevailingly with denticulate leaf-margins some plants have the leaf-margins entirely unarmed. Trelease's *A. dentiens* is based on material from San Esteban Island but does not seem worthy of recognition. In shape, the leaves are similar to the prevailing forms on Angel de la Guarda Island.

At Los Angeles Bay the plants seemed rather constant in shape and armature of leaves. They differed from the Angel de la Guarda plants in having the leaves parallel-margined and with coarser and more widely-spaced teeth. It is frequent on the rock slopes of the hills back from the shore.

On San Marcos Island the plant was seen only on gypsum and was much reduced in stature. On exposed mesas it formed small cæspitose groups with leaves 8-15 cm. long, and

inflorescences 15 dm. high with pauciflorous almost capitate flower-clusters. In ravines or sheltered places the leaves become 25 cm. long, and the inflorescence 25 dm. high and more branched. The leaves are broadest above the middle, and, though occasionally linear-oblong, are usually oblong in outline. The armature consists of a few coarse straight teeth.

Observations on the islands lead one strongly to doubt the value of leaf-shape and armature as diagnostic characters. It seems particularly undesirable that species be based upon them without any idea of the extent of variation exhibited in the field. The colony on Angel de la Guarda Island contains a number of diverse forms. As species have been made in *Agave*, all of them are deserving of specific recognition. Since such taxonomic treatment would be impossible to the author, he has relegated to synonymy a number of species based on leaf-shape and armature.

47. *Agave chrysglossa*, n. sp.

Leaves in rather loose acaulescent rosettes, 5-15 dm. long, 4-6 cm. wide, widest just below the middle, linear-lanceolate, pale yellowish green, glaucescent, concavo-convex, especially towards the apex; spine 25-35 mm. long, subulate or linear-subulate, sulcate to somewhat above the middle, brown, becoming ashy; decurrent for 2-3 dm. and confluent with the narrow firm straight unarmed margin of the leaf; inflorescence 25-40 dm. high, usually bent over, a dense spicate-racemose cluster 15-20 dm. long and about 1 dm. broad; pedicels 4-5 mm. long each with a pair of reflexed filiform or subulate bracts that are 2-3 cm. long and dilated near the base; peduncles stout, 3-4 mm. long; flowers geminate, about 3 cm. long; perianth oblong in the bud, with a broad tube 3 mm. long and bright yellow linear somewhat obtuse segments 15 mm. long and 3-3.5 mm. wide; filaments inserted in the throat, 25-30 mm. long, yellow, flattened; anthers arcuate, 8-9 mm. long; capsule oblong, about 2 cm. long, 12 mm. wide; seeds numerous, dull black, 2-2.5 mm. wide.

Type: No. 1278, Herb. Calif. Acad. Sci., collected April 17, 1921, by I. M. Johnston (no. 3123) on the rocky slopes of San Pedro Nolasco Island, Gulf of California.

This very beautiful species grows on San Pedro Nolasco Island (3123). When found it was enlivening the rocky mid-slopes of the island with spectacular, bright yellow tongues of color. The plants grew singly and produced dense elegant spicate floral clusters 1-2 m. long and 8-10 cm. broad which, due to their weight, almost invariably bent over with their tips nearly touching the ground. The same, or a closely related species, was observed in a sterile condition at San Pedro Bay (4338). The relationships of this species are with *A. vil-moriniana* Berger of Jalisco. This latter was described from a sterile garden plant and differs in its foliage.

48. *Agave oweni*, n. sp.

Acaulescent, surculose; leaves green, lightly glaucous, stiffly spreading, almost flat, 5-8 dm. long, from a base 6-8 cm. broad, abruptly contracted to a sword-like blade 20-25 mm. wide; spine brown to ashy, straight, 10-14 mm. long and 3-5 mm. broad, stout and compressed-terete below but ending in a more or less well pronounced angular acumen 3-4 (or 9) mm. long, evidently decurrent for about 1 cm. and then confluent with the horny leaf-margin, broadly and deeply grooved to about the middle; teeth on a straight hard leaf-margin, blackish brown, thin but hard and firmly attached, sharp, antrorse, triangular, 20-35 mm. long, 1-4 cm. apart; inflorescence 18 dm. high, stalk 38 mm. thick 6 dm. above ground; panicle ovate or oblong in outline, open; pedicels stout, 2-4 mm. long, becoming obese in fruit; flowers pale yellowish, 4 cm. long; ovary fusiform, about 2 cm. long; perianth-tube 4 mm. deep, 11 mm. wide, 6-grooved without; perianth lobes erect, linear-lanceolate, 15-17 mm. long, about 4 mm. wide at the broadened base, obtuse with thickened inrolled tips; filaments compressed-filiform, 35 mm. long, less than 1 mm. wide, adfixed in the throat of perianth-tube; style 40-43 mm. long; capsule oblong, 40-45 mm. long, 20-25 mm. wide; seeds shiny black, 7-8 mm. long, 5-6 mm. wide.

Type: No. 1279 Herb. Calif. Acad. Sci., collected April 14, 1921, by I. M. Johnston (no. 3085) on an islet in **Guaymas Harbor, Sonora.**

Frequent on a scoriæ-covered islet in Guaymas Harbor (3085), and what is assumed to be the same is very common on the rocky slopes about San Carlos Bay. The narrow leaves give the sterile plants much the general appearance of *Yucca whipplei*. The new species evidently belongs to Berger's (Die Agaven 230. 1915) Unterreihe Tequilanæ of the Reihe Rigidæ, and its nearest described relative seems to be *A. yaquiana* Trel. (Contr. U. S. Nat. Herb. 23:120. 1920). *Agave yaquiana* comes from between Hermosillo and Ures and is known only from its leaves which differ from those of *A. oweni* in being more coarsely toothed, 5 cm. (instead of 25 mm.) wide, and in having a spine 25 (not 10-14) mm. long. The new species may be only a geographic form of *A. yaquiana*, but material from the intermediate area and a complete description of *A. yaquiana* are needed before the final disposition of *A. oweni* can be made.

The species is named for Mr. Virgil Owen, ornithologist of the expedition, whose interest in botany added many interesting plants to the collections.

49. *Agave sleviniana*, n. sp.

Acanthescent, non-surculose; leaves yuccoid, glaucous, lance-linear, abruptly narrowed above the very broad base but slightly widening again near the middle and then gradually contracted to the tip, 5-6 dm. long, 25-30 mm. wide near the middle, stiffly spreading; spine light brown to ashy, almost straight, compressed acicular, usually 35 (30-40) mm. long, 3-3.5 mm. wide, with a slit-like groove extending to the middle, narrowly decurrent for 10-12 cm., confluent with the upper pair of teeth; teeth ashy, comparatively few, 10-35 mm. apart, 6-10 mm. long, mostly broadly triangular, variously curved, antrorse, on straight leaf margins; inflorescence 3 m. high, narrowly paniculate above; scape 25 mm. thick 5 dm. above ground; pedicels 5-8 mm. long; flowers in compact clusters, 4 cm. long, with very thin linear-oblong lobes 16-17 mm. long and 4 mm. wide, tube 2 mm. deep; ovary fusiform 17 mm. long; filaments inserted in the throat of the perianth tube, 25 mm. long; anthers 17 mm. long.

Type: No. 1280 Herb. Calif. Acad. Sci., collected April 11, 1921, by I. M. Johnston (no. 3043) on a hillside near **La Paz, Lower California.**

Clearly a near relative of *A. sobria*, with which it agrees in floral characters, but very different from all forms of that species in its very narrow yucca-like leaves. The new species might be considered only a form of *sobria* were it not that the latter species is represented at La Paz by a very evident geographic variety. Rather than accredit another variety to a locality already occupied by a geographical form, *A. sleviniana* is described as a species with the hope that some student may determine its proper relations by further observations about the type locality. The plant is frequent on the rocky cañon sides near the ocean just east of La Paz (3043). It was recognized by some small boys who wrote its name as "sabia."

The species is named for Mr. Joseph Slevin, herpetologist and head of the expedition.

50. *Agave sobria* Brandg.

Agave sobria Brandg., Proc. Calif. Acad. Sci. II, 2:207. 1889.—*Agave cerulata* Trel., Rep. Mo. Bot. Gard. 22:55, t. 45-47. 1912.—*Agave carminis* Trel., Rep. Mo. Bot. Gard. 22:55, t. 48-49. 1912.—*Agave affinis* Trel., Rep. Mo. Bot. Gard. 22:56, t. 52-53. 1912.—*Agave avellanidens* Trel., Rep. Mo. Bot. Gard. 22:60, t. 61-62. 1912.—*Type locality:* Comondú Mesa, Lower California.

Found on the steep hillsides of Carmen and Danzante (3857) islands, and at Escondido (3843) and Agua Verde (3887) bays. The plant has a loose, solitary rosette of a few flat, lanceolate leaves, and an inflorescence usually 2-3 m. high. The collection from Escondido Bay came from a sandy wash where it grew 75 dm. high and had leaves over a meter long, but the common habitat at that locality was on rocky hillsides where the plants became only half as large as those growing in the wash. The Danzante Island plants have rather coarse teeth. Mature capsules from the island collection are 55 mm. long, whereas those from Agua Verde Bay are only 30 mm.

long. As here taken, *A. sobria* includes the common non-succulose agave of the volcanic region along the Sierra Giganta. It varies much in the development of teeth, and in the south is replaced by the following variety:

51. *Agave sobria* var. *roseana* (Trel.), n. comb.

Agave roseana Trel., Rep. Mo. Bot. Gard. 22:59, t. 58-60. 1912. *Agave connochatodon* Trel., Rep. Mo. Bot. Gard. 22:58, t. 57. 1912. *Type locality*: Espiritu Santo Island.

Collected at three different points on Espiritu Santo Island (3989, 3990, 4001, 4002, 4003) where it is frequent on mesas and on steep slopes. The inflorescence becomes 25-40 dm. high. The plants show considerable variation in foliar characters, the leaf-length varying from 2-6 dm., the width from 5-10 cm., and the shape from linear-lanceolate to acutely oblanceolate. The teeth vary from slender to stout, from small (8 mm.) to very large (25 mm. long), and from triangular to tortuous. There seems to be variation in armature according to the age of the plant. The prevailing form on the island (represented by no. 4002) is slightly less heavily armed than is the taxonomic type of *A. roseana*. *Agave connochatodon* from Santa Maria Bay is too close to *roseana* and is simulated by some of the collections from Espiritu Santo Island. On the peninsula *roseana* has been collected at La Paz and near Pichilique. As here taken it differs from *A. sobria* in its coarse armature and southern range, and agrees with it in its general aspect, habit, and floral structures.

The agaves of Lower California have been treated in a special paper by Trelease (Rep. Mo. Bot. Gard. 22:37-65, t. 18-72. 1912) which is admirable for its abundance of carefully selected photographs of types and critical specimens. While studying the Academy collections Trelease's paper has been critically reviewed in the light of the new material and of the acquired field knowledge, and it seems quite evident that Trelease has segregated too finely, due to his over use of leaf-shape and dentition as specific characters. Because of this fact the following new synopsis of the peninsular agaves has been prepared:

Agave promontorii Trel. and *A. aurea* Brandg. are closely related species, the former growing in the cape region and the latter in the vicinity of Comondú. These may be only geographical forms of one species, but as they differ in two unrelated floral measurements, there is reason for maintaining them at least temporarily. The differences are in breadth and length of the perianth lobes. The flowers are similar in size and general appearance, and the plants are the same in habit and aspect. *Agave brandegeei* Trel., from San José del Cabo, is a mixture composed of leaves of *promontorii* and flowers of a species related to *sobria*. The relation between *A. datylio* Weber and *A. vexans* Trel. is somewhat similar to that between *promontorii* and *aurea*. *Agave datylio* comes from the cape region and *vexans* from the middle Sierra Giganta. They differ mainly, if not only, in the length of the stamens. There being only one character involved, the latter is here treated as *A. datylio* var. *vexans*, n. comb. *Agave shawii* Engelm. includes *A. sebastiana* Greene, *A. orcuttiana* Trel., *A. pachyacantha* Trel., and *A. goldmaniana* Trel. These latter species are based on foliar shape and armature which are not constant nor of any value as specific characters. All the segregates of *A. shawii* are the same in appearance, according to Mr. Brandegee.

Surculose; plants simple.

- Perianth lobes broadly lanceolate, united below into a distinct tube; leaves with small close-set teeth.
 Perianth lobes broad, 15 mm. long, 8-12 mm. broad.....*A. aurea*
 Perianth lobes narrow, 18 mm. long, 6-8 mm. broad... *A. promontorii*
 Perianth lobes lance-linear, scarcely united; leaves with coarser more widely spaced teeth.
 Leaves lance-linear, 3 cm. wide or less.....*A. sleviniana*
 Leaves broadly lanceolate or oblanceolate, 5-15 cm. wide.
 Leaf margin nearly straight, with rather small unhooked teeth*A. sobria*
 Leaf margin deeply repand, with coarse hooked teeth*A. s. roseana*
 Non-surculose; rosettes several to each root.
 Short caulescent; leaves obovate, ovate, or oblong, marginal teeth confluent; scape stout; rosettes dense, globular*A. shawii*

- Acaulescent; leaves linear or oblong, marginal teeth distinct; scape slender; rosettes usually very loose. Flowers ochroleucous, conspicuously tubular, stamens adfixed low in tube; leaves linear; spine stout, scarcely decurrent.
- Filaments 35-40 mm. long, exceeding perianth by 20-25 mm. A. *datylio*
- Filaments 20-30 mm. long, exceeding perianth by 10-15 mm. A. *d. vexans*
- Flowers yellow, lobes united only at base, stamens adfixed in throat of very short tube; leaves ovate to linear-oblong or lanceolate; spine long decurrent.
- Leaves broadest above base, about half as broad as long, 15 cm. long, ovate acuminate, forming dense globular rosettes. A. *margaritæ*
- Leaves broadest at base, less than a third as long as wide, 15-80 cm. long, oblong to linear; rosettes loose A. *deserti*

Agave sp.

A single plant of an apparently undescribed species was found on a gravelly bench near the ocean at San Pedro Bay (4338). The leaves are flat, acuminate, obovate, recurving, broadest between the middle and the apex, 5-6 dm. long, 15 cm. wide, and form loose non-surculose rosettes. The inflorescence becomes 27 dm. high. The plant seems to fall in the Unterreihe Euscolymoides of Berger's monograph (Die Agaven 185. 1915) and near *A. saundersii*. It appears to be undescribed but is not named here due to the lack of flowers. The mature fruit is rough, and seems to have rather thick walls.

XV. ORCHIDACEÆ

52. *Epipactis gigantea* Dougl.

Epipactis gigantea Dougl. in Hook., Fl. Bor. Am. 2:202. 1830.—*Serapias gigantea* Eaton, Proc. Biol. Soc. Wash. 21:67. 1908.—*Amesia gigantea* Nels. & Macbride, Bot. Gaz. 56:472. 1913.—*Type locality*: Northwest America.

Very common in moist sheltered places in a cañon in the Sierra Giganta back of Escondido Bay (4395). It occurs most abundantly above 500 m. altitude.

XVI. SAURURACEÆ

53. *Anemopsis californica* H. & A.

Anemopsis californica H. & A., Bot. Beechey 390, t. 92. 1841.—*Type locality*: Santa Barbara, California.

Common on the moist meadows about the reservoir at Mulegé (3692).

XVII. SALICACEÆ

54. *Populus monticola* Brandg.

Populus monticola Brandg., Zoe 1:274. 1890.—*Populus brandegeei* Schneider, Ill. Handb. Laubh. 1:23. 1904.—*Type locality*: Sierra de la Laguna, Lower California.

Found in the upper parts of the large cañon in the Sierra Giganta directly back of Escondido Bay (4120). Previously known only from the type region in the Sierra Laguna about 250 km. to the southward. The tree is common along a small stream, first appearing at about 350 m. alt. and above that growing with *Glaucothea brandegeei* and forming a canopy over the brook. It is a large tree becoming 18 m. high. Bailey (Stand. Cycl. Hort. 2756. 1916) has inferred that this species is merely an escaped form of *P. alba*, but the discovery of this new and very isolated locality would seem to make such an assertion highly improbable.

55. *Salix bonplandiana* H. B. K.

Salix bonplandiana H.B.K., Nov. Gen. et Sp. 2:20, t.101-102. 1817.—*Type locality*: Hidalgo.

Fruiting specimens of this willow were taken from a few young trees growing about the water-holes at Los Angeles Bay (3450). Probably the same species was seen at Mulegé, Escondido Bay, and La Paz.

XVIII. ULMACEÆ

56. *Celtis lævigata* var. *brevipes* (Wats.) Sarg.

Celtis lævigata var. *brevipes* Sarg., Bot. Gaz. 67:226. 1919.
—*Celtis brevipes* Wats. Proc. Am. Acad. 14:297. 1879.—
Type locality: Near Camp Grant, Arizona.

To the above variety is doubtfully referred the *Celtis* collected from rocky ground in the cañon back of Escondido Bay (4108). The plant is locally infrequent, forming a loose shrub 25-35 dm. high on the cañon side and usually in places somewhat protected by sheltering ledges. The *Celtis* mentioned by Goldman (Contr. U. S. Nat. Herb. 16:323. 1916) is the same. Other collections of the plant have been made at San Pablo by Purpus (141), and at Corral Piedra and San Julio Cañon by Brandegee. The peninsular plants have been usually referred to *C. reticulata*, but surely they are not that species, for they differ in having glabrous and much less veiny leaves. They have stiffer and less elongate leaves than Arizonan *brevipes* and may be distinct.

XIX. MORACEÆ

57. *Ficus palmeri* Wats.

Ficus palmeri Wats., Proc. Am. Acad. 24:77. 1889.—*Ficus brandegei* Standley, Contr. U. S. Nat. Herb. 20:22. 1917.—
Type locality: San Pedro Martir Island.

Widely distributed over the gulf area where it was seen on San Pedro Nolasco (3126, 3138, 3139, 3140), San Pedro Martir (3153, 3162), South San Lorenzo (3528, 3534), San Marcos (3625, 3629), Ildefonso (3739, 3740), Carmen (3803), Danzante (3861, 4406), Monserrate, Catalina, Santa Cruz, San Diego (3932, 4097), San Josef, Espiritu Santo (3971, 3979), and Cerralbo (4066) islands; and at San Pedro (4315), San Carlos (4365), Escondido, and Agua Verde (3885) bays. It is a tree which grows in cañons, on mountain sides, and on ocean cliffs down to within a few meters of the water. Although its surroundings vary it seems invariably to grow from the crevices of rocks. The plant varies much in habit according to its habitat, being prostrate or spreading with a breadth of only 1-2 m. and a height of 2-4

dm. when growing in exposed places, forming a domed growth 2-3 m. high when growing in sheltered but dry places, and forming a widely spreading tree 12 m. high and 15 m. broad when in cañons. The plant exhibits its most interesting phase when growing on precipitous cliffs on which it forms grotesque reliefs of broad white roots that spread out and downward over the cliff-face like tangled taffy strands. On San Marcos Island the tree frequents high, sometimes overhanging, gypsum cliffs and lets fall cascades of taffy-like roots from heights of over 30 m. Occasional trees produce aerial roots formed of a brush-like mass 1-3 dm. long borne on the end of a hanging strand sometimes several meters long. The production of aerial roots seems to be an individual matter, for this development may be present or absent on the trees in a single colony. The trunk is white and is usually short, but in well developed trees like those observed at San Pedro Bay the trunk may become 3 m. high and 18 dm. thick.

There is considerable variation in pubescence, even in a single locality, some plants having densely pubescent leaves and silky-villous twigs, whereas others are glabrate or even glabrous. Since there is complete gradation between strongly pubescent and glabrous forms at many localities it becomes impossible to follow Standley in segregating the glabrous forms under the name of *F. brandegei*. The leaves also vary in shape. The common form is cordate, but ovate forms are frequent, and on Danzante Island a single plant was found which had narrowly oblong leaves. The only fully ripe fruit seen was that on a glabrous plant on Ildefonso Island; it was glabrous, yellowish, strongly depressed-globose, and 20-25 mm. broad. The pubescence on the receptacles probably varies with that on the stems and leaves, as immature figs on very pubescent plants are shaggy white-villous. The peduncles do not complete their growth until after the fruit is about one-third developed when they elongate rapidly and finally become 2-5 cm. long. *Ficus palmeri* is the most massive tree in the gulf area and is well known under the name of "salate." Though previously unknown from the mainland of Sonora it was found to be frequent at San Carlos Bay and to be very common about San Pedro Bay. The species has been collected on Tiburon Island.

XX. URTICACEÆ

58. *Parietaria debilis* Forst.

Parietaria debilis Forst., Prodr. 73. 1786.—*Type locality*: New Zealand.

A single large plant was found growing over wet gravel in the cañon in the Sierra Giganta back of Escondido Bay (4119).

XXI. LORANTHACEÆ

59. *Phoradendron californicum* Nutt.

Phoradendron californicum Nutt., Jour. Acad. Phila. II, 1:185. 1848.—*Type locality*: California.

Seen only at the north end of Angel de la Guarda Island (3383) where frequent on *Cercidium microphyllum*, and near Willard's Point on Tiburon Island where common on *Prosopis chilensis*. It forms compact intricate pendant masses 5-10 dm. broad.

59a. *Phoradendron californicum* var. *distans* Trel.

Phoradendron californicum var. *distans* Trel., Univ. Ill. Bull. 45:21, t. 13. 1916.—*Type locality*: Arizona.

Very common on *Prosopis chilensis* at Agua Verde Bay (3907). The habit is quite similar to, but the inflorescence is very different from, that of the species.

60. *Phoradendron diguetianum* Van Tiegh.

Phoradendron diguetianum Van Tiegh., Bull. Mus. Hist. Nat. Paris 1:31. 1895.—*Phoradendron eduardi* Trel., Univ. Ill. Bull. 45:46, t. 47. 1916.—*Phoradendron globuliferum* Trel., Univ. Ill. Bull. 45:48, t. 51. 1916.—*Phoradendron brachyphyllum* Trel., Univ. Ill. Bull. 45:49, t. 53. 1916.—*Phoradendron aureum* Trel., Univ. Ill. Bull. 45:49, t. 52. 1916.—*Phoradendron tumidum* Trel., Univ. Ill. Bull. 45:49, t. 53. 1916.—*Phoradendron peninsulare* Trel., Univ. Ill. Bull. 45:50, t. 55. 1916.—*Phoradendron saccatum* Trel., Univ. Ill. Bull. 45:50, t. 55. 1916.—*Type locality*: Lower California.

Common at most of the stations south of Carmen Island (3841). On Santa Cruz Island (3922) it is extremely abundant and vigorous on *Castelia*, forming huge masses which often nearly equal the host in size. Otherwise found almost universally on *Jatropha spathulata* on which it forms small masses 1-2 dm. long. There seems to be only one variable species of this group in Lower California and not seven as Trelease has indicated in his monograph. Trelease based his species on too few specimens; he entirely disregarded natural distribution, and characterized his species on what seems to be no more than individual variations. The peninsular material agrees in having thick leaves and a compact habit, and is very close to certain mainland forms particularly to *P. globuliferum* which is doubtfully synonymous.

61. *Phoradendron brachystachum* (DC.) Nutt.

Phoradendron brachystachum Nutt., Jour. Acad. Phila. II, 1:185. 1847.—*Viscum brachystachum* DC., Prodr. 4:280. 1830.—*Type locality*: Between Tampico and Real del Monte, Mexico.

Doubtfully referred here is the plant collected on *Jacquinia pungens* at Guaymas (3115) and Tiburon Island (4275).

62. *Struthanthus hænkei* var. *angustus*, n. var.

Leaves linear or lance-linear, sessile or subsessile, 5-10 mm. wide, 5-9 cm. long.

Type: No. 1281, Herb. Calif. Acad. Sci., collected July 7, 1921, by I. M. Johnston (no. 4331) on leguminous trees at San Pedro Bay, Sonora.

Frequent on *Acacia willardiana*, *A. californica*, and *Lysiloma microphylla*, in the cañons about San Pedro Bay (4331) where it forms very elongate pendent clusters 3-12 dm. long. The fruit is reddish. *Struthanthus hænkei* DC. is represented in Sonora by the present narrow-leaved form which, due to its geographic correlation, deserves at least varietal recognition.

XXII. OLACACEÆ

63. *Schœpfia californica* Brandg.

Schœpfia californica Brandg., Proc. Calif. Acad. Sci. II, 2:139. 1889.—*Type locality*: San Gregorio, Lower California.

Seen only at San Nicolas Bay (3711) where a small colony grew in a sandy wash. The plants were dense shrubs 18-30 dm. high with readily falling, leathery or slightly fleshy, dark colored leaves.

64. *Ximenia pubescens* Standley

Ximenia pubescens Standley, Contr. U. S. Nat. Herb. 20:212. 1919.—*Type locality*: Between Mixtepic and Colotepec, Oaxaca.

A dense, intricate, rounded shrub 9-12 dm. high with subcoriaceous glaucous leaves. A few plants were found in the sandy mouth of a cañon bordering on the dunes at San Nicolas Bay (3718). The species is known only from western Mexico and is characterized by its pubescence and its thick veinless orbicular leaf-blades.

XXIII. ARISTOLOCHIACEÆ

65. *Aristolochia brevipes* var. *acuminata* Wats.

Aristolochia brevipes var. *acuminata* Wats., Proc. Am. Acad. 18:148. 1883.—*Aristolochia watsoni* Wooton & Standley, Contr. U. S. Nat. Herb. 16:117. 1913.—*Type locality*: "New Mexico."

Collected in the cañons back of Las Animas (4302) and Agua Verde (3878) bays where its trailing stems form mats, 3-6 dm. broad, on the soft earth at the foot of cliffs. A similar plant was found climbing through densely shaded bushes in the cañon back of Escondido Bay (4128).

XXIV. POLYGONACEÆ

66. *Antigonon leptopus* H. & A.

Antigonon leptopus H. & A., Bot. Beech. 308, t. 69. 1840.
—*Type locality*: Tepic, Mexico.

This very showy vine was seen at San Pedro (4302) and San Carlos bays on the Sonoran coast, and, excepting Catalina Island, at every station along the peninsular coast from Coronados Island and Loreto southward (3844, 3874, 4076). It is a slender, herbaceous climber which grows over rocks on steep slopes, or, more commonly, climbs through the trees in the washes and forms loose growths over their tops. The sepals are usually dark red but at San Pedro Bay they were pink. The large, loose clusters of dark-red flowers are very conspicuous and are most attractive when growing through such light colored branches as *Lysiloma candida*.

67. *Coccoloba goldmanii* Standley

Coccoloba goldmanii Standley, Contr. U. S. Nat. Herb. 23:245. 1922.—*Type locality*: Valley of the Rio Fuerte, Sinaloa.

Common locally in a narrow cañon at San Pedro Bay (4308). An open shrub or small tree 18-45 dm. high. It grew under large fig trees, and with *Sabal* and *Glaucothea*, helped to form a dense almost impenetrable tangle in the cañon bottom.

68. *Eriogonum deflexum* Torr.

Eriogonum deflexum Torr., Bot. Ives Rep. 24. 1860.—
Type locality: Three Point Bend, Colorado River.

A coarse ramose form of this species was collected in a sandy wash at San Luis Gonzales Bay (3342), on dunes near the south end (4212), and on talus slopes near the north end (3372) of Angel de la Guarda Island. The same form was collected at Calamujet by Brandegee. It grows 8-60 dm. high.

69. *Eriogonum galioides*, n. sp.

Perennial from a taproot, mainly glabrous and finely glandular; stems numerous, widely spreading, diffusely dichotomously or trichotomously branched, forming a rounded open dome 2-6 dm. high; leaves in a basal rosette and a few at lower nodes, coriaceous, glabrous above, sparingly setose-hirsute below and on petioles, blade ovate 5-8 mm. long and 4-6 mm. wide, petiole 9-14 mm. long; nodes of inflorescence usually with three-parted bracts whose lobes are divaricate, oblong and more or less connate below; peduncles in the forks and terminal, 2-10 mm. long, straight; involucre 1.5-2 mm. high, 5-parted into ovate-oblong lobes that are widely spreading at maturity, 8-16- but commonly about 10-flowered; pedicels 1-2 mm. long; calyx about 1 mm. long, yellow, in age whitish or rosy and twice as long, glabrous; inner calyx segments lanceolate or ovate-lanceolate, closely enveloping the fruit; outer sepals strongly accrescent, loose and more or less incurving, prolonged-scariate, the basal areas on either side of medial line becoming scarious and saccate-dilated; achenes ovate-lanceolate in outline, the body ovate, the acumen trigonous, about 1.7 mm. long.

Type: No. 1282, Herb. Calif. Acad. Sci., collected April 28, 1921, by I. M. Johnston (no. 3315) in a gravelly wash on **San Luis Island, Gulf of California.**

Seen only on San Luis Island (3315) where common along gravelly washes and to a less extent on hillsides also. At the time of collection it was the only common green flowering herb. The plant is perennial, forming rounded, rather open, clumps as much as 6 dm. high. Herbarium material of the species suggests the habit of certain of the suffrutescent species of *Galium*.

The new species belongs to the subgenus *Ganysma* and seems nearest to the annuals, *E. thomasi* and *E. thurberi*. Its outstanding feature is the parted involucre, a development usually considered diagnostic of *Oxytheca*. Indeed the gross aspect of the plant does have a suggestion of *Oxytheca*, but since in most characters it fits naturally among certain of the *Eriogonums* and does not closely approach any of the known *Oxythecas*, the involucre development should be disregarded

while placing the species generically. It is to be noted that *E. galioides* does not possess the two other developments characteristic of *Oxytheca*; i.e., lenticular achenes and awn-tipped involucre bracts. Among the species of the subgenus *Ganysma* the new species is amply characterized by its perennial habit, parted involucre, small setose leaves, and glabrous saccate sepals. The calyx developments are remarkably like those in *E. thomasii*.

70. *Eriogonum inflatum* var. *deflatum*, n. var.

Eriogonum glaucum Small, Bull. Torr. Cl. 25:51. 1898.—
Type locality: Colorado Desert, California.

Collected at Tepoca (3301) and Los Angeles (3481) bays, and on Angel de la Guarda (3371), Tortuga (3611), and San Marcos (3648) islands. Palmer has collected the same at Los Angeles Bay and at Mulegé. On Tortuga Island the plant was common on lava slopes, but at the other stations it was confined to gravelly soil on diluvial plains. It was called "tivinaja" by a native on San Marcos Island who considered a tea made from its roots as very good for the blood. The present variety is the geographical race present in Sonora, Lower California, and in the Colorado Desert of California. It differs from the species only in its uninflated stems and is significant only because of its distinct range.

71. *Eriogonum orcuttianum* Wats.

Eriogonum orcuttianum Wats., Proc. Am. Acad. 20:371. 1885.—*Type locality*: Cantillas Cañon, Lower California.

This attractive *Eriogonum* was seen only in the cañon in the hills south of Las Animas Bay (3502) where it was locally very common. It was most abundant in crevices of precipitous cañon sides, forming rounded masses 3 dm. high and 6 dm. broad, but it also occurred on the cañon floor and became 6 dm. high and 12 dm. broad. It is a shrub with a dense canopy of light-green leaves and numerous close clusters of white flowers. Within the dome of the foliage the plant is very dense and has concentric, evenly spaced zones formed by the persistent twiggly remnants of the flowering branches of past seasons. The species is known only from the type collection, from Goldman's

collection at the east base of the San Pedro Martir Mountains (Contr. U. S. Nat. Herb. 16:325. 1916), from Brandegee's collection at Paraiso, and from the Las Animas collection just described. The range is evidently the eastern part of the northern half of the peninsula.

XXV. CHENOPODIACEÆ

72. *Allenrolfea occidentalis* (Wats.) Kuntze

Allenrolfea occidentalis Kuntze, Rev. Gen. 1:546. 1891.—*Halostachys occidentalis* Wats., Bot. King Exped. 293. 1871.—*Spirostachys occidentalis* Wats., Proc. Am. Acad. 9:125. 1874.—*Type locality*: About Great Salt Lake, Utah.

A shrub of slightly alkaline soil, occurring abundantly at intervals in the north gulf province and southward at least to Carmen Island. It is decidedly woody and has a very stiff framework of branches 1-2 m. high. Usually growing in colonies and forming belts along the ocean or bordering lagoons. On San Luis Island (3322) it is particularly abundant, reaching 25 dm. in height and making green large areas near the shore.

73. *Atriplex barclayana* (Benth.) Dietr.

Atriplex barclayana Dietr., Synop. 5:537. 1852.—*Obione barclayana* Benth., Bot. Sulph. 48. 1844.—*Atriplex palmeri* Wats., Proc. Am. Acad. 11:146. 1876.—*Atriplex magdalena* Brandg., Proc. Calif. Acad. Sci. II, 2:200. 1889.—*Atriplex dilatata* Greene, Pittonia 1:264. 1889.—*Atriplex insularis* Rose, Contr. U. S. Nat. Herb. 1:80. 1890.—*Atriplex rosei* Standley, N. Am. Fl. 21:60. 1916.—*Atriplex sonora* Standley, N. Am. Fl. 21:62. 1916.—*Type locality*: Magdalena Bay, Lower California.

Present in varying abundance at all stations visited within the gulf area. It is very common and is one of the important floral features especially on some of the more northern islands. On such islands as Patos, Raza, Sal si Puedes, and Santa Inez, all of which are rather level and former bird rookeries, the species is not only dominant but is the plant which is numerically superior in number of individuals as well. Although

occurring in greatest profusion on soils rich in the phosphates from guano, the plant is not confined to them, for it is common on the slightly saline gravels and sands on the beaches and in cañon mouths along the gulf shore. Frequently it occurs well back from the ocean, growing in gravelly washes, but nevertheless saline and guano soils are usually associated with the best development of the species. It avoids strongly saline ground and never grows in or on the immediate borders of salt marshes or lagoons. The characteristic habit of the plant is one with decumbent stems that form a depressed rounded growth 5-10 dm. broad and 25-40 cm. high. The common habit of growth, like the other common characters of the species, is frequently departed from and the plant becomes prostrate and as much as 15 dm. broad and only 2-3 dm. high, or becomes stiffly branched, more or less bushy, and a meter high. Natives at Mulegé and San Marcos Island called the plant "chamiso."

The name *A. barclayana* is used in the same broad sense as that adopted by Hall and Clements in their recent monograph of the genus (Carnegie Inst. Wash. Pub. 326:313. 1923). A number of attempts have been made at segregating this species, but the segregations are all based on characters which are either illusionary or mere extreme variations that later collections have shown to grade off insensibly into other forms. The collected series has been studied and determined by Hall whose comments on them will be found in the monograph referred to. The determinations are as follows:—subsp. *typica*,—Tepoca Bay (3284), Tiburon Island (3259), Patos Island (3242, 3244), San Luis Island (3319, 3221), Isla Partida (3223, 3228, 3229), Los Angeles Bay (3429), Sal si Puedes Island (3525, 3526), South San Lorenzo Island (4191), Isla Raza (3212, 3220), and Ildefonso Island (3750, 3751, 3752); subsp. *sonora*,—San Luis Gonzales Bay (3351), Angel de la Guarda Island (4234), San Esteban Island (3189, 3190, 3191, 3192), North San Lorenzo Island (4196), Santa Inez Island (3651); subsp. *palmcri*,—San Luis Island (3320), Patos Island (3241, 3243), Isla Partida (3232), Isla Raza (3210, 3211, 3213, 3214), and Santa Inez Island (3653). The list of localities is not to be considered in its negative

aspect, for *A. barclayana* was present at stations as far south as Ceralbo Island, but was not collected at the southern localities, due to the conditions of the plants at the time of the visit.

74. *Atriplex hymenelytra* (Torr.) Wats.

Atriplex hymenelytra Wats., Proc. Am. Acad. 9:119. 1874.—*Obione hymenelytra* Torr., Pacif. R. R. Rep. 4:129, t. 20. 1857.—*Type locality*: Along the Williams River, Arizona.

A small colony of this species was found on a west-facing talus slope on a cañon side in the hills back of Los Angeles Bay (3441). It is a dioecious shrub with strictly ascending branches reaching 9-12 dm. in height. The specimens are typical in every respect. The only other collection from Lower California is that of MacDougal in the Cocopah Mountains, a locality not far south of the international boundary.

75. *Atriplex linearis* Wats.

Atriplex linearis Wats., Proc. Am. Acad. 24:72. 1889.—*Artiplex macropoda* Rose & Standley, N. Am. Fl. 21:72. 1916.—*Type locality*: Guaymas, Sonora.

A dense, intricately branched, rounded shrub 6-15 dm. high growing in saline soil bordering salt-flats or lagoons. Collected only at Las Animas Bay (3490) and La Paz (3041), but what is probably the same was observed in alkaline soil at Los Angeles Bay and on South San Lorenzo Island. Called "chamiso" at La Paz.

76. *Atriplex polycarpa* (Torr.) Wats.

Atriplex polycarpa Wats., Proc. Am. Acad. 9:117. 1874.—*Obione polycarpa* Torr., Pacif. R. R. Rep. 4:130. 1857.—*Atriplex curvidens* Brandg., Proc. Calif. Acad. Sci. II, 2:201. 1889.—*Type locality*: Gila River Valley, Arizona.

A rather dense shrub 7-13 dm. high which grows in gravelly soil along washes, on dunes, or occasionally on hillsides. Collected on San Esteban (3191) and Angel de la Guarda (3368) islands. Shrubs seen about San Francisquito and San Luis

Gonzales bays are probably the same. The fruit is produced in great abundance and on San Esteban Island was carried away by ants.

77. *Chenopodium murale* L.

Chenopodium murale L., Sp. Pl. 219. 1753.—*Type locality*: Europe.

Growing as a weed about houses at La Paz and Guaymas. The plant is of particular interest, however, as it represents the only phanerogam found on Georges Island (3312). The plant was no doubt introduced on this isolated island by guano gatherers and now forms a few small colonies on talus loosened by blasting. Despite its out-of-way location the plant represents the common door-yard form of the species.

78. *Salicornia europæa* L.

Salicornia europæa L., Sp. Pl. 3. 1753.—*Salicornia herbacea* L., Sp. Pl. ed. 2, 5. 1762.—*Type locality*: Europe.

At Tepoca Bay, San Luis Gonzales Bay, and at the lagoon on Angel de la Guarda Island, there is a rather abundant erect annual *Salicornia* which probably represents the above species. It grows in salt marshes intermixed with *S. pacifica*. No specimens were taken.

79. *Salicornia pacifica* Standley

Salicornia pacifica Standley, N. Am. Fl. 21:83. 1916.—*Type locality*: Moss Landing, Monterey County, California.

Widely distributed and common in the gulf area. It constitutes the common and characteristic vegetation of salt-marshes over which its clumps of decumbent stems form low even growths 2-3 dm. high. Practically out of flower and only a single collection made (3218).

80. *Suaeda ramosissima* (Standley), n. comb.

Dondia ramosissima Standley, N. Am. Fl. 21:91. 1916.—*Type locality*: Lee's Ferry, Arizona.

Common and widely distributed in the gulf area. It forms very dense hedge-like masses of intricately branched stems,

and usually gets 6-20 dm. high and 9-12 dm. broad. The plant frequents the less saline borders of salt-marshes and is commonly associated with *Maytenus*. For the characters of the species see Standley's note (Bull. Torr. Cl. 44:428. 1917).

XXVI. AMARANTHACEÆ

81. *Amaranthus fimbriatus* (Torr.) Benth.

Amaranthus fimbriatus Benth. in Wats., Bot. Calif. 2:42. 1880.—*Sarratia berlandieri* var. *fimbriata* Torr., Bot. Mex. Bound. 179. 1859.—*Type locality*: Along the Gila River, Arizona.

Seen only on Patos Island where common with *Atriplex* on the low guano flat.

82. *Amaranthus watsoni* Standley

Amaranthus watsoni Standley, Bull. Torr. Cl. 41:505. 1914.—*Amaranthus torreyi* var. *suffruticosus* Uline & Bray, Bot. Gaz. 19:272. 1894.—*Type locality*: Guaymas, Sonora.

A frequent plant in the gulf area. On guano-impregnated or weakly saline flats this *Amaranthus* is the common companion of *Atriplex barclayana*. It was notably abundant on Partida (3225), Sal si Puedes (3527), North San Lorenzo, Santa Inez (3652), Ildefonso (3743), and Pelican islands. According to the sailors these small and apparently barren islands are green during the winter, a condition probably due to the abundance of this *Amaranthus*. It was also collected at La Paz (3032).

83. *Celosia floribunda* Gray

Celosia floribunda Gray, Proc. Am. Acad. 5:167. 1861.—*Type locality*: Cape San Lucas, Lower California.

Seen only at Escondido (3845) and Agua Verde (3906) bays, and on Espiritu Santo and Ceralbo (4050) islands. It is a shrub or small tree 15-45 dm. high growing in gravelly soil. Occasionally with several tufted stems, but usually with a simple ascending trunk 1-2 dm. thick. Cattle appear to relish the foliage and but few plants were found which failed

to show evidences of browsing. The flowers are borne on sparsely leafy, whip-like branches which commonly lop over and droop due to the weight of the inflorescence.

84. *Iresine angustifolium* Euphr.

Iresine angustifolium Euphr., Beskr. St. Barthel. 165. 1795.—*Type locality*: St. Bartholomew Island, West Indies.

Growing in rocky places in cañons on Santa Cruz, Espiritu Santo (3968), and Ceralbo (4065) islands, and at Escondido and Agua Verde (3891). bays. Stems slender, erectly branched from near the base, and forming bushy growths 6-10 dm. high and 3-5 dm. broad. Not abundant at any locality.

85. *Frœlichia interrupta* (L.) Moq.

Frœlichia interrupta Moq. in DC., Prodr. 13²:421. 1849.—*Gomphrena interrupta* L., Sp. Pl. 224. 1753.—*Type locality*: America.

Abundant on the dunes near Gordas Point, Ceralbo Island (4029). Forming mats 3-6 dm. broad. In the specimens collected the leaves are obovate or oblong, densely tomentose, and 20-25 mm. long. Brandegee's collections from San José del Cabo have less tomentose oblanceolate leaves which are 4-8 cm. long.

XXVII. NYCTAGINACEÆ

86. *Abronia maritima* Nutt.

Abronia maritima Nutt. in Wats., Bot. Calif. 2:4. 1880.—*Type locality*: San Pedro, California.

Trailing over the sand on the beaches and dunes along the gulf shore. Not abundant anywhere although widely distributed. Seen at San Pedro Bay, Kino Point, Tiburon Island (3279), Tepoca Bay (3310), Angel de la Guarda Island (4243), San Francisquito Bay, San Nicolas Bay, Carmen Island, Catalina Island, San Diego Island, San Josef Island, San Francisco Island (3953), La Paz, and Ceralbo Island.

87. *Allionia incarnata* L.

Allionia incarnata L., Syst. Nat. ed. 10, 890. 1759.—*Wedelia incarnata* Kuntze, Rev. Gen. 2:533. 1891.—*Wedeliella incarnata* Cockerell, Torreya 9:167. 1909.—*Allionia malacoides* Benth., Bot. Sulph. 44. 1844.—*Type locality*: Venezuela.

Collected at Tepoca (3286), San Luis Gonzales (3335), and San Francisquito (3561) bays, growing in well drained soil somewhat back from the gulf. Dried remnants of what were taken to be this were seen at Escondido Bay and on Angel de la Guarda Island.

88. *Boerhaavia caribæa* Jacq.

Boerhaavia caribæa Jacq., Obs. Bot. 4:5. 1771.—*Boerhaavia sonora* Rose, Contr. U. S. Nat. Herb. 1:111. 1891.—*Boerhaavia ixodes* Standley, Contr. U. S. Nat. Herb. 13:423. 1911.—*Type locality*: West Indies.

Collected in sandy soil at Mulegé (3670) and on the rocky slopes directly back of Guaymas (3091). What was taken to be an annual umbellate-flowered species of *Boerhaavia* was observed in a crisped state on Tortuga, Santa Inez, and Ildefonso islands where it seemed very common.

89. *Boerhaavia scandens* L.

Boerhaavia scandens L., Sp. Pl. 3. 1753.—*Commicarpus scandens* Standley, Contr. U. S. Nat. Herb. 12:373. 1909.—*Type locality*: Jamaica.

Infrequent in sandy soil near the shore of San Nicolas Bay (3719). Forming a very slender scandent shrub supported by the low bushes up through which it grew. *Boerhaavia elongata* Brandg. (Proc. Calif. Acad. Sci. II, 2:199. 1889) from San Pablo, is very near *scandens* and seems to be no more than a form of it.

90. *Mirabilis tenuiloba* Wats.

Mirabilis tenuiloba Wats., Proc. Am. Acad. 17:375. 1882.—*Hesperonia tenuiloba* Standley, Contr. U. S. Nat. Herb. 12:363. 1909.—*Hesperonia polyphylla* Standley, Contr. U. S.

Nat. Herb. 12:364. 1909.—*Mirabilis tenuiloba* var. *polyphylla* Macbride, Contr. Gray Herb. II, 56:23. 1918.—*Type locality*: Talquitz Cañon, San Jacinto Mts., California.

Growing on talus slopes at Las Animas Bay (3318) and at Puerto Refugio on Angel de la Guarda Island (3370). A viscid villous shrubby plant growing 2-3 dm. high and frequently over a meter broad.

91. *Pisonia flavescens* Standley

Pisonia flavescens Standley, Contr. U. S. Nat. Herb. 13:389. 1911.—*Type locality*: San José del Cabo, Lower California.

Frequent in the lower part of the rocky cañon in the Sierra Giganta directly back of Escondido Bay (4134). It is an erectly branched tree 45-90 dm. high, with an open crown of slender horizontal ultimate branches. All the plants seen were conspicuously spurred but were lacking in spines.

XXVIII. BATIDACEÆ

92. *Batis maritima* L.

Batis maritima L. Syst. Nat. ed. 10, 1289. 1759.—*Type locality*: Not given.

Found only on Angel de la Guarda Island, Isla Raza (3217), Carmen Island, Escondido Bay, San Josef Island, San Evaristo Bay, Espiritu Santo Island, and La Paz (3046). It forms dense mats on the tide flats along with *Salicornia* and *Monathochloë*.

XXIX. PHYTOLACCACEÆ

93. *Phaulothamnus spinescens* Gray

Phaulothamnus spinescens Gray, Proc. Am. Acad. 20:293. 1884.—*Type locality*: Northwest Sonora, probably along the Asuncion River.

Seen only on an islet in Guaymas Harbor (3083), and in a wash at San Pedro Bay (4329). A homely spinescent Lycioid shrub 9-18 dm. high. The fruit is drupaceous and whitish in color.

94. *Stegnosperma halimifolia* Benth.

Stegnosperma halimifolia Benth., Bot. Sulph. 17, t. 12. 1844.—*Type locality*: Cape San Lucas, Lower California.

Widely distributed over the gulf area but not abundant. It was seen at San Pedro, Tepoca (3298), San Luis Gonzales, Los Angeles (3488), Las Animas (3512), San Francisquito, Mulegé, Coyote, San Nicolas, Loreto, Escondido, Agua Verde, San Evaristo, and La Paz bays; and on Tiburon, Angel de la Guarda (3354), San Esteban (3166), South San Lorenzo, Tortuga (3593), Coronados, Carmen (3825), Danzante, Monserrate, Santa Cruz, San Diego, San Josef, Espiritu Santo, and Ceralbo islands. A rather decorative plant with pallid, slightly succulent leaves. It is a self-supporting or semiscandent shrub which commonly grows in gravelly or sandy washes attaining a height between 15 and 25 dm. The fruiting plant is very attractive having elongated spreading or drooping racemes of reddish globose capsules which split stellately at maturity and expose the red aril and later the shiny black seeds. The flowers are pure white.

XXX. AIZOACEÆ

95. *Sesuvium sessile* Pers.

Sesuvium sessile Pers., Synop. 2:39. 1807.—*Type locality*: Not given.

Collected only on Isla Raza (3216), but frequent about lagoons and salt-marshes in all parts of the gulf.

96. *Trianthema portulacastrum* L.

Trianthema portulacastrum L., Sp. Pl. 223. 1753.—*Trianthema monogyna* L., Mant. 1:69. 1767.—*Type locality*: Jamaica.

Common on Patos Island growing on the guano flats with *Atriplex*. At Puerto Ballandra on Carmen Island (3816) it is common about a salt-marsh forming mats 15-25 cm. broad.

XXXI. PORTULACACEÆ

97. *Portulaca pilosa* L.

Portulaca pilosa L., Sp. Pl. 445. 1753.—*Type locality*: Central America.

Infrequent in slightly saline sandy soil in the gulf area. It was notably common on the mesa-like summit of Ildefonso Island (3749). Elsewhere it was collected only at La Paz (3033, 3057, 3064).

XXXII. CARYOPHYLLACEÆ

98. *Achyronychia cooperi* T. & G.

Achyronychia cooperi T. & G., Proc. Am. Acad. 7:331. 1867.—*Type locality*: Camp Cady, California.

A small colony of this species was found on a silty flat near the south end of Angel de la Guarda Island (4207). On the peninsula, Purpus has taken it at Calmalli, and Brandegee on Magdalena Island.

99. *Drymaria arenarioides* Willd.

Drymaria arenarioides Willd. in R. & S., Syst. 5:406. 1819.—*Drymaria frankenioides* H.B.K., Nov. Gen. et Sp. 6:21, t. 515. 1823.—*Type locality*: Pachuca, Hidalgo.

Referred here is a single plant collected from a soil-filled crevice on one of the mesa-like ridge-crests of Espiritu Santo Island (3972). It is half as tall, more dense, has shorter leaves and smaller flowers than the peninsular plants referred to this species. The island plant seems to be undescribed. The Pacific Coast material of *D. arenarioides* has linear leaves the width of which is half that of the linear-lanceolate leaves of material of eastern Mexico, and it too seems without a name.

100. *Drymaria holosteoides* Benth.

Drymaria holosteoides Benth., Bot. Sulph. 16. 1844.—*Drymaria veatchii* Curran, Proc. Calif. Acad. Sci. II, 1:227. 1888.—*Drymaria pachyphylla* Wooton & Standley, Contr. U.S. Nat. Herb. 16:121. 1913.—*Type locality*: Given as Cape San

Lucas, but probably from Magdalena Bay (Brandege, Proc. Calif. Acad. Sci. II, 3:219. 1892).

Collected on Tiburon (4263) and San Francisco (3949) islands; and at San Luis Gonzales Bay (3329), Mulegé (3690), Coyote Bay (4178), and La Paz (3048). The plant is annual with widely ascending branches and seems to frequent sandy places, especially those with a trace of salinity. *Drymaria crassifolium* (cf. Brandege, Zoe 2:68. 1891) is a very closely related form known only from San José del Cabo, and with little more than its perennial habit to distinguish it.

XXXIII. CERATOPHYLLACEÆ

101. *Ceratophyllum demersum* L.

Ceratophyllum demersum L., Sp. Pl. 992. 1753.—*Type locality*: Europe.

Very common and freely fruiting at Mulegé (3688).

XXXIV. PAPAVERACEÆ

102. *Argemone mexicana* L.

Argemone mexicana L. Sp. Pl. 508. 1753.—*Type locality*: Mexico.

An infrequent plant on the gravelly plain back of La Paz (3053). The sap and flowers are yellow.

103. *Argemone platyceras* var. *gracilentata* (Greene) Fedde

Argemone platyceras var. *gracilentata* Fedde, Pflanzenr. 4¹⁰⁴:285. 1909.—*Argemone gracilentata* Greene, Pittonia 3:346. 1898.—*Type locality*: Mulegé, Lower California.

Collected on the beach on Catalina Island (4104), and on the silty river bottom at Mulegé (3665). The plant is rather strict in growth, attaining a height of 9-18 dm. The sap is colorless. This variety is only a small-flowered slender form of *A. platyceras*. Prain (Jour. Bot. 33:364. 1895) refers isotypes of Greene's species to *A. intermedia* subsp. *parviflora*.

104. *Argemone platyceras* var. *hispida* (Gray) Prain

Argemone platyceras var. *hispida* Prain, Jour. Bot. 33:367. 1895.—*Argemone hispida* Gray, Pl. Fendler. 5. 1845.—*Type locality*: About Santa Fe, New Mexico.

To this species is doubtfully to be referred a very peculiar collection made at the lagoon on Angel de la Guarda Island (3398). The specimens came from a small colony growing on an outcrop at the edge of an elevated mesa somewhat back from the shore. The plant had a woody caudex 3-6 dm. high upon which were borne the ascending simple stems of the year, these about 6 dm. long. Fruit, but no flowers, was found. The leaves are glaucous, aculeate, with shallow teeth, and are oblong in shape and narrowed towards the base. The shrubby character of the plant is very peculiar, but due to the lack of flowers, the plant is not named here.

XXXV. CRUCIFERÆ

105. *Lepidium lasiocarpum* Nutt.

Lepidium lasiocarpum Nutt., in T. & G., Fl. N. Am. 1:115. 1838.—*Type locality*: Santa Barbara, California.

Occasional in the cultivated fields at Mulegé (3700).

106. *Sibara palmeri* (Wats.) Greene

Sibara palmeri Greene, Pittonia 3:12. 1896.—*Cardamine palmeri* Wats., Proc. Am. Acad. 24:38. 1889.—*Type locality*: Mulegé, Lower California.

What is taken to be a form of this species was collected from the shelter of a bank in a sandy wash at San Nicolas Bay (3704). The plants agree with some collected by Brandegee at Magdalena Island in having the leaves more or less deeply lobed with coarse segments. The type has coarsely toothed leaves.

XXXVI CAPPARIDACEÆ

107. *Atamisquea emarginata* Miers

Atamisquea emarginata Miers in Hook., Bot. Miscel. 3:143. 1833.—*Type locality*: Chile.

Observed on San Esteban (3176), Tiburon (3278, 4244), Angel de la Guarda, Tortuga (3596), Coronados, Carmen, Danzante, Monserrate, San Josef (3937, 3942), San Francisco, and Espiritu Santo islands; and at San Carlos Bay, San Pedro Bay, Kino Point (4287), Tepoca Bay, Las Animas Bay (3511), San Francisquito Bay, Mulegé, Guadalupe Point, San Nicolas Bay (3706), Loreto, Escondido Bay, San Evaristo Bay, and La Paz. It is a compact, upright, light-green shrub 15-30 dm. high characteristic of sandy or gravelly soil. Occasionally, however, it occurs on hillsides, as for example, on Tortuga Island. It is twiggy with rigid divaricate branches which are very brittle and become much broken in pressing. The flowers, which are produced in great abundance, have white or creamy petals and are quite fragrant. The bush is interesting and seems to have no bad qualities save its brittleness. The author's observations do not agree with those of Brandegee, who wrote that it is an illsmelling and disagreeable plant. Brandegee (Proc. Calif. Acad. Sci. II, 2:128. 1889) has pointed out a number of supposed differences between the North and South American forms referred to this species, but a careful comparison of material from the Argentine and Lower California revealed the forms indistinguishable.

108. *Forchammeria watsoni* Rose

Forchammeria watsoni Rose, Contr. U. S. Nat. Herb. 1:302, t. 24-25. 1895.—*Type locality*: Guaymas, Sonora.

This interesting tree was seen at Guaymas (3119), San Carlos Bay (4352), San Pedro Bay (4317), Guadalupe Point in Concepcion Bay (4149, 4405), Escondido Bay, Agua Verde Bay (3872, 3905), San Josef Island (4086), Espiritu Santo Island (3995), and Ceralbo Island (4056). In the Brandegee herbarium there are specimens from San José del Cabo and Purisima. At no place was the tree found to be common over large areas. It usually grows scattered, or as at Guadalupe

Point and Agua Verde Bay, forms small local groves. Most of the plants seen occurred on gravelly plains, but those on Espiritu Santo and Ceralbo islands grew on rocky hillsides while the plants at Escondido Bay grew at 450 m. altitude on a cañon side in the Sierra Giganta.

A tree commonly 30-45 dm. high but frequently attaining 9 m. in height. The trunk averages about 15 dm. high and 15-30 cm. thick, though at times becoming 3 m. high and 30-65 cm. thick. The crown is large and spreading, and formed of heavy branches. The bark is thin, tight, and though appearing smoothish at a short distance, is finally rugose, being covered with numerous crowded tiny plates; it is dark in color with an ashy cast. The bark must be very slow-growing, as some initials dated 1893 were so plain that they appeared as if carved the year previous to our visit. The trees are dioecious with an apparent preponderance of staminate plants. The male aments are produced in tremendous quantities, the ground under the trees being deeply covered with them. The wood is said to be practically useless which must be so, for woodcutters were seen working among these trees without molesting them. The fruit is more or less pear-shaped and is reddish plum-colored when ripe. The pulp is sweetish and has a peculiar but not a disagreeable flavor. The fruit is structurally two-celled with one cell regularly aborted and represented in the mature fruit by a flattened elongated cavity just under the old stigma. Neither the fruit nor the tree has any suggestion of other Cappariaceæ, and the inclusion of the genus in that family is far from satisfactory. At Agua Verde Bay some boys called the tree "Palo San Juan." The younger trees bear leaves that are conspicuously narrower than those on the old trees.

109. *Wislizenia refracta* Engelm.

Wislizenia refracta Engelm. in Wisliz., Mem. No. Mex. 99. 1848.—*Wislizenia scabrida* Eastw., Bull. Torr. Cl. 30:490. 1903.—*Wislizenia melilotoides* Greene, Proc. Biol. Soc. Wash. 19:130. 1906.—*Wislizenia californica* Greene, Proc. Biol. Soc. Wash. 19:130. 1906.—*Wislizenia divaricata* Greene, Proc. Biol. Soc. Wash. 19:130. 1906.—*Wislizenia pascalis* Greene

Proc. Biol. Soc. Wash. 19:131. 1906.—*Wislizenia costellata* Rose, Proc. Biol. Soc. Wash. 19:132. 1906.—*Type locality*: Near El Paso, Texas.

A bushy herbaceous plant about 9 dm. high, common on the sands along the shore at La Paz (3044). Several small boys called it "Rama Maria." It has been frequently collected at La Paz, a collection by Palmer being the type of *W. pacalis*. While all the segregates, the types of which have been seen, are not exactly like typical *W. refracta*, the differences which characterize them are so trivial or are so blurred by intermediates that segregation seems unwise. The most pronounced of the variants is that named *W. melilotoides*. In its extreme it is characterized by smooth etuberculate carpels and deserves to be called **Wislizenia refracta** var. **melilotoides**, n. comb. It should be noted that in Toumey's Tuscon collection, the original of *W. scabrida*, the old fruits are tuberculate and rugose, whereas the maturing fruit is mainly smooth and etuberculate.

110. *Wislizenia refracta* var. *palmeri* (Gray), n. comb.

Wislizenia palmeri Gray, Proc. Am. Acad. 8:622. 1873.—*Wislizenia fruticosa* Greene, Proc. Biol. Soc. Wash. 19:131. 1906.—*Wislizenia mamillata* Rose, Proc. Biol. Soc. Wash. 19:132. 1906.—*Type locality*: On the lower Colorado River.

Common on the dunes at the head of San Luis Gonzales Bay and at Las Animas Bay (3501). A somewhat shrubby plant with loosely tufted stems 7-11 dm. high. This plant is a good variety of *refracta* but scarcely more. There is a tendency for the leaves to be unifoliate, but they commonly are one, two, and three foliate all on one and the same branch. There is also considerable variation within a single collection as to the frequency of the several leaflet numbers. In the Brandegee specimen of *Palmer* 74 from Guaymas, isotype of *W. mamillata*, the leaves are predominately trifoliate and similar to those in the type of *W. refracta*. In foliage there is no break between the completely trifoliate condition present in the type of *W. refracta* and the unifoliate condition in the type of *W. palmeri*. Correlated with the tendency to unifoliate leaves is the tendency to mammillate-tuberculate crests on the carpels.

In their extreme the high tubercules are very characteristic, but like the leaflets they grade off into developments indistinguishable from those of *W. refracta*. Greene's *W. fruticosa* was collected at Calamajuet by Brandegee, but although the base does seem somewhat woody, Mr. Brandegee insists that it was annual like the other forms of the species. Collections of the variety *palmeri*, however, seem slightly more shrubby than the common plants north of the international boundary.

XXXVII. CRASSULACEÆ

111. *Dudleya albiflora* Rose

Dudleya albiflora Rose, Bull. N. Y. Bot. Gard. 3:13. 1903.
—*Cotyledon albiflorum* Fedde in Just, Jahresb. 31:826. 1904.
—*Type locality*: Magdalena Bay, Lower California.

Locally common on a sheltered basalt cliff in a narrow cañon near the Isthmus on Espiritu Santo Island (3986). The plants were found in a resting condition and only living material was taken, this all sent to Dr. Rose with whom it flowered and by whom it was determined. Previously known only from about Magdalena Bay.

XXXVIII. KRAMERIACEÆ

112. *Krameria canescens* Gray

Krameria canescens Gray, Pl. Wright. 1:42. 1852.—
Krameria grayi Rose & Painter, Contr. U. S. Nat. Herb. 10:108. 1906.—*Type locality*: Prairies near the Pecos River, Texas.

To this species are referred specimens from San Nicolas Bay (3710), San Marcos Island (3638), Las Animas Bay (3497), and Los Angeles Bay (3451). Also of this species are *Palmer 252* from Santa Agueda, and *Purpus 186* from near Calmalli. The plant grows in sandy or gravelly soil forming a flattened, very intricate shrub 5-10 dm. high and 10-18 dm. broad. On San Marcos Island it was called "mesquitilla" and said to be used in dyeing; information similar to that given to Palmer (Contr. U. S. Nat. Herb. 1:81. 1890) at Santa Agueda.

113. *Krameria canescens* var. *paucifolia* Rose

Krameria canescens var. *paucifolia* Rose, Contr. U. S. Nat. Herb. 1:66. 1890.—*Krameria paucifolia* Rose, Contr. U. S. Nat. Herb. 10:108. 1906.—*Type locality*: La Paz, Lower California.

Collected at La Paz (4011), San Evaristo Bay (4095), and San Pedro Bay (4303). The habits are the same as in the species. The variety is not clean cut, but may well be retained for the southern form of *canescens* in which the leaves are small, remote, non-canescens, and oily-glandular. It occurs over the southern quarter of the peninsula and on the mainland from the region of Guaymas southward.

XXXIX. LEGUMINOSÆ

114. *Acacia californica* Brandg.

Acacia californica Brandg., Proc. Calif. Acad. Sci. II, 3:221. 1892.—*Type locality*: La Palma, Lower California.

Frequent along washes at San Pedro Bay (4333) forming upright unarmed trees or large shrubs 18-45 dm. high. The plant flowers profusely as the leaves unfold.

115. *Acacia cymbispina* Sprague & Riley

Acacia cymbispina Sprague & Riley, Kew Bull. 1923:394. 1923.—*Type locality*: Guaymas, Sonora.

Common on the rocky hillsides about Guaymas (3094) where it forms an open, loosely branched shrub 15-20 dm. high.

116. *Acacia farnesiana* (L.) Willd.

Acacia farnesiana Willd., Sp. Pl. 4:1083. 1806.—*Mimosa farnesiana* L. Sp. Pl. 521. 1753.—*Vachellia farnesiana* Wigh. & Arn., Prodr. 272. 1834.—*Type locality*: Santo Domingo.

Collected at Guaymas (3105), San Carlos Bay (4368), and at Loreto (3775). At the first two localities it was naturalized, but at Loreto it grew only in fence corners about town and was known as "huizache." It is an open loosely spreading thorny shrub 15-20 dm. high.

117. *Acacia filicioides* (Cav.) Trel.

Acacia filicioides Trel., Rep. Ark. Geol. Surv. 4:178. 1891.—*Mimosa filicioides* Cav., Icones 1:55, t. 78. 1791.—*Acacia filicina* Willd., Sp. Pl.4:1072. 1806.—*Type locality*: Mexico.

A loosely branched weak shrub 18-27 dm. high which grows in gravelly washes. A few plants were found on Ceralbo Island (4064) and a single one in a cañon back of Escondido Bay (4130).

118. *Acacia greggii* Gray

Acacia greggii Gray, Pl. Wright. 1:65. 1852.—*Type locality*: Valley west of Patos, Chihuahua.

Seen only on Tiburon (4254, 4278) and Angel de la Guarda (3419) islands where it grows along gravelly cañon floors. It is a very thorny shrub 15-20 dm. high and usually has a clear trunk about 1 m. long and 2-8 cm. thick. The trunk is seldom erect, it being usually bent over and the bushy crown, which is 15-20 dm. wide, supported by other shrubs. The peninsular specimens, notably *Palmer 534* from Los Angeles Bay, show a tendency towards pedicellate flowers and, due to this fact, have been identified as *A. wrightii*.

119. *Acacia sonorensis* Rose

Acacia sonorensis Rose, Contr. U. S. Nat. Herb. 8:31. 1903.—*Type locality*: Near Guaymas, Sonora.

Referred here is a collection made in a cañon back of Agua Verde Bay (3881). The plant has many widely spreading stems and forms thicket-like growths along the gravelly cañon floor. The determination must remain doubtful as the description of *A. sonorensis* is so brief as to be ambiguous, and as the type has been either lost or misplaced. The Agua Verde collection (similar to the peninsular material identified as *A. amentacea*) differs from the description of *A. sonorensis* in having more numerous (4-6 not 2-3 pairs) and smaller (3-6 not 6-12 mm. long) leaflets, and pubescent (not glabrate) legumes. It may be that *A. sonorensis* is the mainland form of *A. californica* although the spike is described short for that latter species. The peninsular plant, which may be unde-

scribed, is closely related to *A. amentacca* but differs in its more numerous smaller greener pubescent leaflets, and larger darker pubescent fruits.

120. *Acacia willardiana* Rose

Acacia willardiana Rose, Contr. U. S. Nat. Herb. 1:88. 1890.—*Prosopis heterophylla* Benth., London Jour. Bot. 5:82. 1846.—*Type locality*: "Sonora alta in Mexico."

A slender, open, very graceful tree 25-90 dm. high, which is common on the rocky hillsides along the Sonoran coast from Willard Point on Tiburon Island (4252) southward to the islands in Guaymas Harbor (3081). The plant was collected on San Pedro Nolasco Island (3125) where it is abundant over the upper slopes, at the south end of Tiburon Island (4271), and at San Pedro (4334) and San Carlos (4376) bays. Brandegee has a collection from the inland locality of Hermosillo. Standley (Contr. U. S. Nat. Herb. 23:376. 1922) reports the species from Lower California, but it was not seen there by Mr. Brandegee or the author, nor has its occurrence there been elsewhere recorded in the literature; furthermore, there are no peninsular collections of it in the Brandegee, Gray or National herbaria.

The tree is typical of rocky slopes and is a particularly notable feature of the skyline in the region of its occurrence. Its branches are few and strict, but above it is very loosely branched into slender drooping twigs. The trunk becomes 2 dm. thick and like the branches has a smooth tight, white, somewhat glaucous, bark which annually exfoliates in thin papery pieces. The clean white stems, and the airy open crown with its drooping twigs and pendent phylloidal petioles unite to give the tree a supple grace that is very attractive. The tree is worthy of adoption as an ornamental.

Acacia sp.

A globose shrub 12-25 dm. high, frequent in gravelly soil near the ocean at Candeleros Bay on Espiritu Santo Island (4073). It is a stiff, rough, reddish stemmed plant with many stout, straight, pallid thorns and fine bipinnate leaves. The flowers are yellow or rarely pink, and are in globose heads.

The fruit necessary for positive determination is lacking. The relationships of the plant seem to be with *A. constricta* Benth. It differs from that species in its coarse, rough, reddish bark, and in its stout, short, unbracted peduncles. It probably is the same as the unexamined Bryant plant reported by Brandegee (Proc. Calif. Acad. Sci. II, 3:221. 1892). The island plant is probably an unnamed form.

121. *Desmanthus fruticosus* Rose

Desmanthus fruticosus Rose, Contr. U. S. Nat. Herb. 1:131, t. 13. 1892.—*Acuan fruticosum* Standley, Contr. U. S. Nat. Herb. 23:366. 1922.—*Type locality*: Carmen Island.

Frequent in gravelly washes in the gulf area. It is a weak shrub with few erect branches. Its common height is between 10 and 25 dm., but occasionally it becomes 35 dm. high; usually with a clear trunk 6-9 dm. high and 15-25 mm. thick. Collected on Tiburon (4260), Angel de la Guarda (3422), and San Esteban (3196) islands; also at Las Animas (3519), San Nicolas (3724), and Coyote (4169) bays.

122. *Lysiloma candida* Brandg.

Lysiloma candida Brandg., Proc. Calif. Acad. Sci. II, 2:153. 1889.—*Type locality*: Purisima, Lower California.

A very common and characteristic tree about most of the stations from San Marcos Island (3613) and Mulegé (3680) southward (3459, 3785, 3827, 3880, 4042, 4057). It was not seen on Santa Inez, Ildefonso, Catalina, and San Francisco islands. Indistinguishable plants occur in abundance at San Pedro Bay in Sonora (4294). There is no tree more characteristic of the southern half of the peninsula. It usually occurs in abundance and forms open groves on the cañon floors and washes, and to a less extent also on the rocky hillsides. It is a clean, white-barked, erect-growing tree commonly 3-6 m. high. Though usually small it does become quite large, some trees growing 9-12 m. high and having a clear trunk 10-15 dm. high and 6-9 dm. thick. In very old trees the bark ceases to be smooth and chalky, and becomes dark with thick flakes. The plant is widely known as "palo blanco" and its bark is gathered

and sold by the natives for tanning purposes. To a more or less extent all localities show the depredations of bark-hunters, but in some of the more readily accessible localities they have cut the trees even on the steep rocky slopes. Despite the rapacity of bark-hunters the species is in no danger of extermination, as it sprouts readily and produces abundant seeds. The decorticated wood is used for fuel in some localities, but usually it is strewn over the cañon floor and left to decay.

123. *Lysiloma microphylla* Benth.

Lysiloma microphylla Benth., London Jour. Bot. 3:83. 1844.
—*Type locality*: Between Mexico City and Zacatecas.

A dark-barked tree 25-45 dm. high, which is common in the gravelly washes about San Pedro Bay (4313, 4330). Standley (Contr. U. S. Nat. Herb. 23:390. 1922) considers *L. divaricata* (Jacq.) Benth. identical with the glabrous forms previously referred to *L. microphylla*. If this is correct then the latter must be submerged in the former, as there seem to be all gradations between the glabrous condition and the sparsely puberulent one. The extremes in pubescence do not seem worthy of even minor denominations. As Jacquin's plant is said to have come from the West Indies, and as his plate (Pl. Hort. Schoenbr. 3: t. 395. 1798) shows a plant twice as robust as any Mexican specimen, Bentham's name is here accepted. Regarding *L. divaricata* see the note by Riley (Kew Bull. 1923:396. 1923).

124. *Pithecollobium confine* Standley

Pithecollobium confine Standley, Contr. U. S. Nat. Herb. 20:191. 1919.—*Type locality*: Cape San Lucas, Lower California.

Observed at Los Angeles Bay (3442, 3440), Las Animas Bay (3498), San Francisquito Bay (3565), San Nicolas Bay, Monserrate Island, Catalina Island, Santa Cruz Island (3917), San Diego Island, Espiritu Santo Island, and Ceralbo Island. Brandegee has collections from San José del Cabo, Todos Santos, and San Gregorio. The plant forms a coarse, rigid, tough, thorny shrub 9-30 dm. high. It may be loose and

irregularly branched to form a rounded mass, or may, as usual on the islands, form a low, compact, very flat-topped growth. The pods vary considerably in size and weight, even in a single locality.

In the past this species has been mainly referred to *P. flexicaule*, a closely related but quite distinct species of eastern Mexico. Macbride (Contr. Gray Herb. II, 59:2. 1919) has referred *P. flexicaule* to the genus *Samanea*, a step which, if proper, would necessitate a similar treatment of *P. confine*. Macbride, however, overlooked the fact that, if *P. flexicaule* and *P. saman* are congeneric, then Small's genus *Siderocarpus* (Bull. N. Y. Bot. Gard. 2:91. 1901) would have priority over Merrill's *Samanea* (Jour. Wash. Acad. Sci. 6:46. 1916). The type species of *Siderocarpus* is *P. flexicaule*.

125. *Pithecollobium dulce* (Roxb.) Benth.

Pithecollobium dulce Benth., London Jour. Bot. 3:199. 1844.—*Mimosa dulcis* Roxb. Corom. Pl. 1: t. 99. 1795.—*Type locality*: Described from trees cultivated in India but native of Mexico.

Collected in a semi-wild condition at Agua Verde Bay (3903) and Mulegé (3664), and seen in cultivation at La Paz, Loreto, Los Angeles Bay (3433), and Guaymas.

126. *Pithecollobium sonoræ* Wats.

Pithecollobium sonoræ Wats., Proc. Am. Acad. 24:49. 1889.—*Type locality*: Guaymas, Sonora.

A thorny, erect-growing shrub 15-28 dm. high which is frequent about shallow draws on the slopes about Guaymas (3082, 3110). It is a very disagreeable plant to deal with when occurring in abundance.

127. *Prosopis chilensis* (Molina) Stuntz

Prosopis chilensis Stuntz, U. S. Bur. Pl. Indust., Invent. 31:85. 1914—*Ceratonia chilensis* Molina, Sagg. Chile 172. 1782.—*Prosopis juliflora* DC., Prodr. 2:447. 1825.—*Mimosa juliflora* Swartz. Prodr. Veg. Ind. Occ. 85. 1788.—*Prosopis glandulosa* Torr., Ann. Lyc. N. Y. 2:192. 1828.—*Prosopis*

odorata Torr. & Frem. in Frem. 2nd Rep. 313, t. 1. 1845.—*Prosopis articulata* Wats., Proc. Am. Acad. 24:48. 1889.—*Type locality*: Chile.

Frequent in gravelly soil throughout the gulf area (3107, 3434, 3458, 3708, 3784, 3788, 4087, 4137, 4259, 4269). An arborescent tree or large shrub which is usually 3-5 m. high, but which not infrequently becomes 6-9 m. in height. It was particularly abundant about Escondido Bay and on the plains at the south end of Tiburon Island where it formed groves which, in places, excluded all other trees. The peninsular material has leaflets which average half the size of those in the material from Sonora and the northern gulf islands. The small-leaved form also occurs about Guaymas, for the type of *P. articulata* is such a plant. Called "mesquite" at Loreto where the young branches were used for fodder.

128. *Cæsalpinia gracilis* Benth.

Cæsalpinia gracilis Benth. in Hemsley, Diag. Pl. Nov. 9. 1878.—*Type locality*: "Sonora alta."

Found only at San Carlos Bay (4356) where it grew on a gravelly cañon floor forming an open shrub 12-18 dm. high. The flower is bright yellow and is quite odd because of the large, keel-like, coarsely fimbriate, brownish, lower sepal. The plant flowers as the leaves unfold.

129. *Cæsalpinia palmeri* Wats.

Cæsalpinia palmeri Wats., Proc. Am. Acad. 24:47. 1889.—*Poinciana palmeri* Rose, Contr. U. S. Nat. Herb. 13:303. 1911.—*Type locality*: Guaymas, Sonora.

A loose, slender-stemmed shrub 12-15 dm. high which was collected on a stony flat at Guaymas (3104), and in a wash at San Carlos Bay (4354).

130. *Cæsalpinia pannosa* Brandg.

Cæsalpinia pannosa Brandg., Proc. Calif. Acad. Sci. II, 2:150. 1889.—*Poinciana pannosa* Rose, Contr. U. S. Nat. Herb. 13:303. 1911.—*Cæsalpinia mexicana* var. *californica* Gray, Proc. Am. Acad. 5:157. 1862.—*Poinciana californica*

Rose, Contr. U. S. Nat. Herb. 13:303. 1911.—*Type locality*: San Jorge, Lower California.

Seen only at La Paz (3039) and Loreto (3774). At the former station it grew on the bluffs facing the sea and at the latter on a sandy plain where, due to the ravages of cattle, it grew successfully only amongst thorn-thickets or unpalatable shrubs. It is a loose shrub 10-15 dm. high. A very close relative of the Sonoran *C. palmieri* and perhaps not distinct from it.

131. *Cassia confinis* Greene

Cassia confinis Greene, Pittonia 3:225. 1897.—*Type locality*: Los Angeles Bay, Lower California.

Although collected only at San Francisquito Bay (3573) and on Espiritu Santo Island (3992), the plant was observed on Angel de la Guarda, Tortuga, Carmen, and Ceralbo islands, and at Las Animas Bay, Santa Rosalia, Guadalupe Point, San Evaristo Bay, and La Paz. It is a very villous, suffrutescent plant with few coarse rigid ascending stems. Growing scattered over gravelly washes and commonly becoming 4-6 dm. high.

132. *Cassia crotalarioides* Kunth

Cassia crotalarioides Kunth, Mimos. 132, t. 40. 1823.—*Cassia covesii* Gray, Proc. Am. Acad. 7:399. 1868.—*Type locality*: Near the city of Guanajuato, Mexico.

Seen only at Guaymas (3102, 4408) where a small colony was found in packed soil at the foot of the hills back of town.

133. *Cercidium microphyllum* (Torr.) Rose & Johnston

Cercidium microphyllum Rose & Johnston, Contr. Gray Herb. II, 70:66. 1924.—*Parkinsonia microphylla* Torr., Bot. Mex. Bound. 59. 1859.—*Type locality*: Near Fort Yuma, Arizona.

Specimens were taken at Guaymas (3084), San Luis Gonzales Bay (3348), Angel de la Guarda Island (3379), Tortuga Island (4409), Coyote Bay (4172), and near Loreto (3787). Leafless and sterile palo verdes were seen at most

of the stations in the gulf area, but while in the field the several species of *Cercidium* were so confused that trustworthy field determinations are lacking. It seems probable, however, that the palo verde seen on the peninsula north of Loreto was *C. microphyllum*. It also seems likely that much of what Goldman (Contr. U. S. Nat. Herb 16:335. 1916) refers to *C. torreyanum* is in fact *C. microphyllum*, for it is highly improbable that he could have completely missed so common a tree as is the latter. It is a spreading tree 25-55 dm. high which commonly grows in gravelly soil but which is occasional also on warm hillsides. The petals are all pale yellow with the exception of the standard, which is white. At Loreto it was called "palo de pau" and the stems used for forage.

134. *Cercidium molle*, n. sp.

Tree 6 m. high and nearly as broad; young branches slender, drooping, unarmed, canescent with a fine rather dense strigose pubescence; leaves remote, 1 or 2 in an axil, with fine sparse pubescence; petiole 1-8 mm. long; pinnæ one pair, with 4-6 pairs of leaflets; rachis 12-40 mm. long; leaflets oblong, base narrowed and oblique, apex truncate, 6-10 mm. long, 2.5-4.5 mm. broad; petiolule about 0.5 mm. long; inflorescence a 3-7-flowered raceme, branches with a fine spreading pubescence; sepals yellowish, pubescent, lobes linear-oblong, 7-8 mm. long; petals lemon-yellow, lower one 13 mm. long with a deltoid-ovate blade 7 mm. long and a claw 6 mm. long, four upper ones 10 mm. long with ovate-rhomboid blades 8 mm. long; filaments 1 cm. long, villous near the base; anthers burnt-orange in color; ovary very densely strigose except on upper edge; legume 4-9 cm. long, 6-8 mm. wide, much flattened, 1-4 seeded, margin strongly undulate.

Type: No. 1283, Herb. Calif. Acad. Sci., collected May 26, 1921, by I. M. Johnston (no. 3877) from a solitary tree in a wash at Agua Verde Bay, Lower California.

An exceptionally well-marked, new *Cercidium*, characterized by its slender drooping unarmed twigs, large multijugate pinnæ, and long, compressed, strongly undulate legumes. It appears to have no close relatives. The new species is a tree with a spreading crown which, due to its slender drooping

branches, has much of the general aspect of *Parkinsonia aculeata*. Only a single specimen of this tree was seen, that growing on the gravelly floor of a large cañon which runs southward from Agua Verde Bay (3877).

135. *Cercidium peninsulare* Rose

Cercidium peninsulare Rose, Contr. U. S. Nat. Herb. 8:301. 1905.—*Type locality*: La Paz, Lower California.

Collected only at La Paz (3038) and on Carmen Island (3802), but it is probably the common palo verde which was seen at most of the stations south of Carmen Island. Goldman (Contr. U. S. Nat. Herb. 16:336. 1916) has interesting data on this species. It seems to be an endemic peninsular form nearest to *C. floridum* of the southwestern United States from which it differs in its pubescent and duller colored twigs.

136. *Cercidium præcox* (R. & P.) Harms

Cercidium præcox Harms, Engler's Jahrb. 42:91. 1908.—*Sappania præcox* R. & P., Fl. Peruv. t. 376, ined.—*Casalpinia præcox* H. & A., Bot. Miscl. 3:208. 1833.—*Cercidium spinosum* Tul., Arch. Mus. Hist. Nat. Paris 4:134. 1845.—*Rhettinophlæum viride* Karst., Fl. Columb. 2:25, t. 113. 1862-69.—*Cercidium viride* Karst., in Engler, Jahrb. 8:346. 1887.—*Cercidium plurifoliolatum* Micheli, Mem. Soc. Phys. Nat. Hist. Geneve 34:269, t. 18. 1903.—*Cercidium goldmani* Rose, Contr. U. S. Nat. Herb. 8:301. 1905.—*Cercidium unijuga* Rose, Contr. U. S. Nat. Herb. 8:301. 1905.—*Type locality*: Peru.

Collected on an islet in Guaymas Harbor (3078), on Tortuga Island (3592), and on the exact summit of Idefonso Island (3753). Some sprawling leafless palo verdes seen at Marquer Bay on Carmen Island are probably the same. Rose (14466) has a collection from San José del Cabo, the only known peninsular collection.

The plant is infrequent but often locally abundant on Tortuga Island. There although the plant has an erect trunk 3-9 dm. high, its branches do not grow erect, but instead spread out horizontally or recline and thereby cover an area all out of

proportion to its height. The largest trees seen on Tortuga Island were only 2 m. high although they had a span of 8 m. Even the young plants start to sprawl, the main shoot falling over, lying along the ground, and partially supporting the branches which fall over later. This peculiar habit is not due to exposure, for plants in sheltered situations are similar in habit to those on open slopes. It should be said here that no erect palo verdes were noted on Tortuga Island; as specimens of *Cercidium microphyllum* were mixed in with the Tortuga collection of *C. praecox*, that former species may also have a sprawling habit on Tortuga Island. Sterile leafless *Cercidium*s seen in the washes at Marquer Bay, Carmen Island, had growth habit identical with the Tortuga plants.

137. *Hæmatoxylon brasiletto* Karst.

Hæmatoxylon brasiletto Karst., Fl. Columb. 2:27, t. 114. 1862-69.—*Hæmatoxylon boreale* Wats., Proc. Am. Acad. 21:426. 1886.—*Type locality*: Republic of Colombia.

Frequent along shallow draws on the stony slopes about Guaymas (3080, 3111). Infrequent in a wash at San Pedro Bay (4335). It is a loose thorny shrub 12-20 dm. high. The petals are bright yellow; the standard is lined with carmine.

138. *Hoffmanseggia intricata* Brandg.

Hoffmanseggia intricata Brandg., Proc. Calif. Acad. Sci. II, 2:151. 1889.—*Hoffmanseggia glabra* var. *intricata* Fisher, Contr. U. S. Nat. Herb. 1:147. 1892.—*Hoffmanseggia microphylla* var. *glabra* Wats., Proc. Am. Acad. 24:47. 1889. hyponym.—*Hoffmanscggia glabra* Fisher, Contr. U. S. Nat. Herb. 1:147. 1892.—*Type locality*: Campo Aleman, Lower California.

Seen only at San Francisquito Bay (3586) and on San Esteban Island (3185). At the latter station it was common in a broad gravelly wash forming compact rounded shrubs 3-6 dm. high or scraggly growths 6-9 dm. high. The standard is yellow dotted with brownish red, but the other petals are entirely reddish.

139. *Hoffmanseggia microphylla* Torr.

Hoffmanseggia microphylla Torr., Bot. Mex. Bound. 58. 1859.—*Type locality*: Colorado Desert, California.

Collected at Tepoca Bay (3281), San Luis Island (3324), San Luis Gonzales Bay (3334), and Angel de la Guarda Island (3381). It grows in gravelly washes and seems to like best the gravelly benches along their borders. A nearly leafless shrub 6-12 dm. high, whose branches are simple below but loosely though strictly branched above. It is usually loosely tufted and upright, but occasionally becomes broadly globular in form. The flowers are yellow with the standard streaked with reddish.

140. *Æschynomene nivea* Brandg.

Æschynomene nivea Brandg., Proc. Calif. Acad. Sci. II, 2:150. 1889.—*Type locality*: Purisima, Lower California.

An erect, little-branched, graceful shrub 2-3 m. high which is frequent in washes and on hillsides at San Nicolas Bay (3713), Coyote Bay, Gualalupe Point, Loreto and Escondido Bay; and on Coronados, Carmen, Danzante, Monserrate, Santa Cruz, San Diego, San Josef, Espiritu Santo (3964), and Ceralbo islands. The flowers are yellow with the wings deep yellow, the keel greenish, and the standard yellow with a greenish medial line.

141. *Astragalus aridus* Gray

Astragalus aridus Gray, Proc. Am. Acad. 6:223. 1864.—*Astragalus albatius* Shelton, Minn. Bot. Studies 1:128. 1894.—*Type locality*: Colorado Desert, California.

What is taken to represent a small-leaved form of this species was frequent on the dunes at Tepoca Bay (3306). The stems are silky tomentose, strictly erect, and become 45-50 cm. high.

142. *Astragalus coulteri* Benth.

Astragalus coulteri Benth., Pl. Hartw. 307. 1848.—*Type locality*: Probably in the Colorado Desert or southwestern Arizona.

Referred here is the small-leaved, silky tomentose *Astragalus* found so commonly on the dunes at San Francisquito Bay (3552). The stems are strictly ascending.

143. *Astragalus insularis* Kell.

Astragalus insularis Kell., Bull. Calif. Acad. Sci. 1:6. 1884.
—*Type locality*: Cedros Island.

There seems nothing to distinguish the Cedros Island plants from the *Astragalus* which grows so commonly in a wash on South San Lorenzo Island (3538). The flowers are magenta but dry bluish. The stems are ascending and 1-4 dm. high.

144. *Coursetia glandulosa* Gray

Coursetia glandulosa Gray, Proc. Am. Acad. 5:156. 1861.
—*Type locality*: Cape San Lucas, Lower California.

A weak, erect shrub 25 dm. high, which is frequent in a wash at Guaymas (3112). Standard mainly white, but with tip and back frequently pinkish or red. The wings are yellow. Vasey and Rose (Contr. U. S. Nat. Herb. 1:88. 1890) have a lengthy note on this species.

145. *Diphysa occidentalis* Rose

Diphysa occidentalis Rose, Contr. U. S. Nat. Herb. 12:271. 1909.—*Type locality*: Guaymas, Sonora.

A slender, loose shrub 18-24 dm. high, which was found covered with yellow flowers and unfolding leaves. It was frequent along washes at San Pedro (4309) and San Carlos (4361) bays. Perhaps only a good variety of *D. sennoides*.

146. *Errazurizia megacarpa* (Wats.), n. comb.

Dalea megacarpa Wats., Proc. Am. Acad. 20:359. 1885.—*Parosela megacarpa* Standley, Contr. U. S. Nat. Herb. 23:460. 1922.—*Psorobatus megacarpus* Rydb. N. Am. Fl. 24:41. 1919.
—*Type locality*: Northwest Sonora near the gulf shore about 150 miles south of the boundary.

This is an ill-smelling shrub whose exceedingly numerous stems form a dense globose bush 8-10 dm. high. It is charac-

teristic of sandy soils, though at San Francisquito Bay it occurs also on a stony mesa. The corolla is gaping and not at all papilionaceous, being composed of thickish subequal yellow petals. It was collected at Tepoca Bay (3294) which is near, if not the actual type locality, and at San Luis Gonzales Bay (3348), San Francisquito Bay (3579), Tiburon Island (3252), and Angel de la Guarda Island (4226). Brandegee has it from Calamujuet and Llanos de San Julian, and Palmer has it from Los Angeles Bay and Santa Rosalia. Nothing more is on record regarding its range.

Although in the past the plant has been usually treated as a member of either *Dalea* or *Parosela*, it and its two close relatives seem worthy of special generic recognition. These plants are notable because of their peculiar corollas which are more or less non-papilionaceous, and composed of thickish very firm yellow petals that are entirely distinct, almost clawless, evidently spreading, and scarcely exerted from the calyx. The three species are characterized by a very ramose shrubby habit, a loose spicate inflorescence, and coarse white tomentose stems that are studded with brown tuberculate glands. The associates of *A. macrocarpa* are, **E. benthami** (Brandg.), n. comb., or *Dalea benthami* Brandg. (Proc. Calif. Acad. Sci. II, 2:148. 1890) a species native to the islands off the west coast of the peninsula, and **E. multifoliolata** (Clos), n. comb., or *Psoralea multifoliolata* Clos (Gay, Fl. Chile 2:87. 1846) which is known only from northern Chile. Rydberg (loc. cit.) gave the name *Psorobatus* to the North American species, but the Chilean species was called *Errazurizia* by Phillipi (Ann. Univ. Chile 1872:688) nearly 50 years previously. The Chilean species has a more irregular corolla and is hence nearer to *Parosela* than are the Mexican species, but is evidently congeneric with the latter, and must be associated with them if the genus is to be a natural one.

147. *Indigofera argentata*, n. sp.

A pallid, erect-growing shrub with strictly ascending sub-simple stems, 15-25 dm. high; old stems brownish and glabrous; young stems with terminal decimeter densely white strigose-tomentose and more or less stained by glandular secretions;

below the densely pubescent growing parts the stems clear white with a light thinning silky-strigose pubescence; leaves oddpinnate, unicolored, younger densely silvery silky strigose but older with a thinner pubescence and somewhat greenish; rhachis 4-8 cm. long, quadrangular, densely pubescent, with a circle of deciduous usually subulate glands about the base of petiolules; leaflets opposite, 15-17, linear-oblong to narrowly elliptical, 2-3 cm. long, 4-6 mm. wide, tip rounded and usually apiculate; petiolule 1 mm. long; racemes many-flowered, strictly ascending, 5-15 cm. long; calyx densely silvery strigose, oblique, unequally cleft into linear-oblong lobes; keel 1 cm. long, white, densely strigose in bud; standard and wings pink or rose; connectives brownish, cuspidate-prolonged and tipped by a tuft of short hairs; ovary silky strigose; legumes pendulous on recurved pedicels 3-4 mm. long, brown, canescent with a sparse strigose pubescence, strongly flattened, somewhat curved, 25-40 mm. long, 4-5 mm. wide, valves separating from the replum after maturity; seeds 6-12, rectangular, brown, inconspicuously rugose.

Type: No. 1284, Herb. Calif. Acad. Sci., collected June 6, 1921, by I. M. Johnston (no. 4036) in a wash near Gordas Point on Ceralbo Island, Gulf of California.

A very distinct new species of the section *Euindigofera* and of Baker's (Oliver, Fl. Trop. Africa 2:68. 1871) group *Tinctoræ*. It is characterized by its erect, shrubby habit, silvery pubescence, large flowers, narrow leaflets, and manner of fructal dehiscence. It differs from *I. fruticosa* Rose (Contr. U. S. Nat. Herb 5:140. 1897), the type of which came from San José del Cabo, in its more erect, less branched habit, numerous elongate silvery leaflets, larger flowers, and larger canescent legumes. It was collected at two different localities on Ceralbo Island (4036, 4067) where it grew scattered along gravelly washes, forming loose silvery shrubs about 2 m. tall.

148. *Lotus tomentellus* Greene

Lotus tomentellus Greene, Pittonia 2:140. 1890.—*Type locality*: Los Angeles Bay, Lower California.

Frequent on a silty flat on Angel de la Guarda Island (4206), forming herbaceous mats 6-12 dm. broad. Observed

on San Luis Island and at San Luis Gonzales Bay. The flowers are yellow.

149. *Lupinus arizonicus* var. *barbatulus* Thornb.

Lupinus arizonicus var. *barbatulus* Thornb. in Smith, Bull. Torr. Cl. 47:497. 1920.—*Type locality*: Valley of the Colorado River, Arizona.

In sandy soil at San Luis Gonzales Bay (3341), San Francisco Bay (3569), and San Marcos Island (3635). The flowers are pinkish.

150. *Olneya tesota* Gray

Olneya tesota Gray, Mem. Am. Acad. II 5:328. 1855.—*Type locality*: Tablelands along the lower part of the Gila River, Arizona.

Widely distributed over the gulf area, being observed at all the peninsular stations and at all the Sonoran stations with the exception of Guaymas (3290, 3444, 3780, 3786). It was seen on the following islands:—Tiburón (3277), Angel de la Guarda, San Esteban (3205), Coronados, Carmen, Danzante, Monserrate, Santa Cruz, San Josef, San Francisco, Espiritu Santo (3969), and Ceralbo (4041). It is a grayish, usually thorny, tree or shrub most characteristic of gravelly benches along washes. It occurs not infrequently on hillsides and in gravelly washes. Usually an upright arborescent shrub 30-45 dm. high, but some very old trees become truly arborescent with a spreading crown and a height of 7-9 m. The bark is dark, furrowed, and loose. The plant is usually viciously thorny, though some individuals, these seemingly most abundant in the south, show a tendency to be unarmed. Some plants are entirely unarmed while others vary from thornless to very thorny even on a single limb. The plant flowers in great profusion, being usually leafless at that time. The standard is rosy, or white with faint markings. The wings and keel are magenta with the latter a trifle lighter in tone. At Loreto the flowering plants were called "palo tinta," but the heavy hard wood, which is widely used as fuel, is well known about the gulf as "palo fierro."

151. *Parosela divaricata* var. *cinerea* (Gray), n. comb.

Dalea divaricata var. *cinerea* Gray, Proc. Am. Acad. 7:335. 1868.—*Dalea parryi* Gray, Proc. Am. Acad. 7:397. 1868.—*Parosela parryi* Heller, Cat. N. Am. Pl. ed. 2, 6. 1900.—*Dalea maritima* Brandg., Proc. Calif. Acad. Sci. II, 3:125. 1891.—*Parosela maritima* Rose, Contr. U. S. Nat. Herb. 8:304. 1905.—*Parosela oculata* Rydb. N. Am. Fl. 24:60. 1919.—*Type locality*: Fort Mohave, Arizona.

An inhabitant of sandy or gravelly soil, which was collected at Angel de la Guarda (3387, 3411), San Esteban (3187), Tortuga (3599), and San Francisco (3948) islands; and at San Francisquito Bay (3564). The plant is very variable, being prostrate or strict or bushy, and annual or perennial. The common growth form is strict and tufted, but some of the Angel de la Guarda plants were loosely bushy and 6-9 dm. high. The flowers are a deep rich blue. Material from Magdalena Bay, topotypes of Bentham's *D. divaricata* (with synonyms in *P. variegata* Rydb. and *D. anthonyi* Brandg.), differs from the Academy collections and from Californian material only in the lack of pubescence. A difference in pubescence is scarcely worthy of specific rank and so the northern plant is treated as a variety.

152. *Parosela emoryi* (Gray) Heller

Parosela emoryi Heller, Cat. N. Am. Pl. ed. 2, 6. 1900.—*Dalea emoryi* Gray, Mem. Am. Acad. II, 5:315. 1854.—*Psorothamnus emoryi* Rydb., N. Am. Fl. 24:47. 1919.—*Dalea tinctoria* Brandg., Proc. Calif. Acad. Sci. II, 2:147. 1889.—*Psorothamnus tinctorius* Rydb., N. Am. Fl. 24:47. 1919.—*Parosela tinctoria* Standley, Contr. U. S. Nat. Herb. 23:462. 1922.—*Dalea tinctoria* var. *arenaria* Brandg., Proc. Calif. Acad. Sci. II, 2:147. 1889.—*Psorothamnus arenarius* Rydb., N. Am. Fl. 24:47. 1919.—*Parosela arenaria* Standley, Contr. U. S. Nat. Herb. 23:462. 1922.—*Psorothamnus dentatus* Rydb., N. Am. Fl. 24:47. 1919.—*Parosela dentata* Standley, Contr. U. S. Nat. Herb. 23:462. 1922.—*Psorothamnus junceus* Rydb., N. Am. Fl. 24:48. 1919.—*Parosela juncea*

Standley, Contr. U. S. Nat. Herb. 23:462. 1922.—*Type locality*: Tableland along the Gila River, Arizona.

A low, spreading, flat-topped, loosely intricate, grayish shrub 4-9 dm. high and 9-12 dm. broad. It has a strong odor. The glands of the calyx heavily stain the collecting papers with yellow and orange. It is one of the characteristic shrubs on the dunes in the gulf area, but also occurs frequently in sandy washes back from the coast and, as on Tortuga Island, occasionally occurs even on hillsides. It was collected on Kino Point (4286), Tiburon Island (3247), San Luis Gonzales Bay (3344), Angel de la Guarda Island (3367, 4231), Las Animas bay (3515), San Francisquito Bay (3544), Tortuga Island (3601), San Nicolas Bay (3715), and La Paz (4013).

The plants of this species vary considerably in size and form of leaf, and to a less extent in amount and distribution of pubescence. There seems to be no way by which *P. emoryi* and *P. tinctoria* can be separated, even by characters varietal in importance, for the chief difference seems to be a slight one in the denseness of tomentum. Rydberg's *P. dentatus* is said to differ from *P. tinctoria* in its distinctly dentate leaves despite the fact that the type of the latter has definitely toothed leaflets. Brandege's variety *arenaria*, characterized by very elongate leaflets and glabrous stem and foliage, seems worthy of varietal rank, and is to be called **Parosela emoryi** var. *arenaria*, n. comb. *Psorothamnus junceus* Rydb. is a form of *Parosela emoryi* with rigid, naked stems and should be called **Parosela emoryi** var. *juncea*, n. comb.

153. *Parosela mollis* (Benth.) Heller

Parosela mollis Heller, Cat. N. Am. Pl. ed. 2, 6. 1900.—*Dalea mollis* Benth., Pl. Hartw. 306. 1844.—*Parosela pilosa* Rydb., N. Am. Fl. 24:64. 1919.—*Type locality*: Deserts between California and Sonora.

Noted only on Tiburon (3251), San Luis, Angel de la Guarda (4235), and Tortuga (3602) islands. It forms mats which may become a meter broad. Usually growing in sandy soil but on Tortuga Island growing on a barren lava slope.

154. *Parosela spinosa* (Gray) Heller

Parosela spinosa Heller, Cat. N. Am. Pl. ed. 2, 7. 1900.—*Dalea spinosa* Gray, Mem. Am. Acad. II, 5:315. 1854.—*Asagræa spinosa* Baillon, Adansonia 9:233. 1870.—*Psorodendron spinosum* Rydb., N. Am. Fl. 24:45. 1919.—*Type locality*: Along the Gila River, Arizona.

Although in a sterile condition this unmistakable shrub was recognized at San Luis Gonzales Bay, Los Angeles Bay, and on Angel de la Guarda Island. It is a gray, spiny shrub 25-30 dm. high which grows along gravelly washes. Frequent locally at each station.

155. *Phaseolus atropurpureus* var. *sericeus* Gray

Phaseolus atropurpureus var. *sericeus* Gray, Proc. Am. Acad. 5:156. 1861.—*Type locality*: Cape San Lucas, Lower California.

Climbing along a fence at Mulegé (3687). The flowers are a very dark purple.

156. *Phaseolus filiformis* Benth.

Phaseolus filiformis Benth., Bot. Sulph. 13. 1844.—*Type locality*: Magdalena Bay, Lower California.

As to foliage this species is highly polymorphous, varying from unifoliate to trifoliate and from very broadly to very narrowly lobed. The flowers are pink. It usually grows in sandy soil twining up through low shrubbery. Frequently it forms prostrate matted growths some of which are 15 dm. broad. It was collected at Guaymas (3089), Tiburon Island (3265), Angel de la Guarda Island (4220, 4225), Las Animas Bay (3513), San Francisquito Bay (3554), and Loreto (3794).

157. *Rhynchosia phaseoloides* (Swartz) DC.

Rhynchosia phaseoloides DC., Prodr. 2:385. 1825.—*Glycine phaseoloides* Swartz, Fl. Ind. Occ. 1248. 1806.—*Dolicholus phaseoloides* Kuntze, Rev. Gen. 3²:62. 1898.—*Type locality*: Jamaica.

Twining high through shrubs along a roadside in the river bottom at Mulegé (3686). The seeds are entirely red. The

flowers have a brownish standard, yellow wings, and a greenish keel. All other peninsular collections have larger bicolored seeds.

158. *Tephrosia purisimæ* Brandg.

Tephrosia purisimæ Brandg., Proc. Calif. Acad. Sci. II, 2:149. 1889.—*Type locality*: Purisima, Lower California.

Common in washes at San Nicolas Bay (3709). A single plant was found on a rocky hillside at Mulegé (3695). It is a tufted perennial 6 dm. high with numerous ascending stems and pink flowers.

XL. ZYGOPHYLLACEÆ

159. *Fagonia chilensis* H. & A.

Fagonia chilensis H. & A., Bot. Miscl. 3:165. 1833.—*Fagonia californica* Benth., Bot. Sulph. 10. 1844.—*Fagonia californica* var. *hindsiana* Benth., Bot. Sulph. 10. 1844.—*Fagonia californica* var. *barclayana* Benth., Bot. Sulph. 10. 1844.—*Fagonia aspera* Gay, Fl. Chile 1:470. 1845.—*Fagonia palmeri* Vasey & Rose, Contr. U. S. Nat. Herb. 1:82. 1890.—*Fagonia subaphylla* Philippi, Pl. Itin. Tarapaca 12. 1891.—*Fagonia californica* var. *glutinosa* Vail, Bull. Torr. Bot. Cl. 22:229. 1895.—*Fagonia viscosa* Rydb., N. Am. Fl. 25:104. 1910.—*Fagonia pachyacantha* Rydb., N. Am. Fl. 25:105. 1910.—*Fagonia insularis* Standley, Proc. Biol. Soc. Wash. 24:247. 1911.—*Fagonia rosci* Standley, Proc. Biol. Soc. Wash. 24:247. 1911.—*Fagonia lævis* Standley, Proc. Biol. Soc. Wash. 24:249. 1911.—*Fagonia longipes* Standley, Proc. Biol. Soc. Wash. 24:250. 1911.—*Type locality*: Chile.

A study of Chilean material, including specimens of the original collection of *F. chilensis*, has shown conclusively that *F. chilensis* is character for character the same as the typical phase of *F. californica*. Since, as pointed out elsewhere (Contr. Gray Herb. II, 70:72. 1924), the American forms of the genus are separable from the Mediterranean *F. cretica* by efficient fruit-characters, *F. chilensis* is taken up as the proper name for the North American plants current as *F. californica*. Standley (Proc. Biol. Soc. Wash. 24:243-250.

1911) accredits 13 species of *Fagonia* to America. Of this number, however, only *F. scoparia* Brandg. seems unquestionably distinct, the remaining 12 appearing to be only intergrading forms of a single variable species. In North America the very variable *F. chilensis* reaches its greatest development in Lower California and areas immediately adjacent. Upon the basis of field-knowledge acquired during the Expedition and upon repeated subsequent herbaria studies, a new classification of the variants of *F. chilensis* is offered here.

The first impression gained upon a casual inspection of herbarium material is that the North American material is extremely and erratically variable. A careful study has shown, however, that there are several geographically correlated tendencies which deserve some minor designation. In his treatment, Standley emphasizes glandularity and pubescence, but these criteria are not as satisfactory in natural primary segregation as is stipular development. The stipules in the South American and Magdalena Island collections, as well as in the bulk of the material from the gulf islands and from California and Lower California, are 1.5-4 mm. long. About the upper part of the gulf there occur forms with stipules 5-12 mm. long. Of both these long and short stipuled forms, there are forms with large and small leaves, and forms with glandular or pubescent or glabrous herbage. The combining of these characters may best be appreciated by the study of the following key to the varieties of *F. chilensis*.

- Stipules mostly 1-3 mm. long; plant glabrous to glandular.
 Leaves large and broad, 8-20 mm. long, 3-7 mm. broad.
 Glabrous *typica*
 Pubescent *barclayana*
 More or less scabrous..... *aspera*
 Leaves small and narrow, 1-8 mm. long, 1-3 mm. broad.
 Glabrate.
 Leaves 2-8 mm. long..... *lavis*
 Leaves 1-2 mm. long..... *rosei*
 Densely glandular..... *insularis*
 Stipules mostly 4-12 mm. long; plant glandular.
 Leaves broad, 3-8 mm. wide..... *glutinosa*
 Leaves narrow, 1-2 mm. wide.
 Leaflets 3..... *pachycantha*
 Leaflets 5..... *palmeri*

The typical, broad-leaved form of the species has synonyms in *F. californica*, and *F. californica* var. *Hindsiana*, and occurs in Chile and the western part of the southern half of the peninsula. *Fagonia chilensis* var. *barclayana*, n. comb., differs from *typica* in its pubescence. It occurs with *typica* in Lower California and apparently in Chile also. *Fagonia chilensis* var. *aspera*, n. comb. in its extreme is very scabrous, but forms of it are frequently distinguishable with difficulty from the var. *typica* and var. *barclayana*. The variety was originally founded on material from Chile, but certain rather scabrous plants from western Lower California seem referable to it. *Fagonia chilensis* var. *lævis*, comb. nov., with glabrate linear-oblong leaves, is the prevailing form of *F. chilensis* in the deserts north of the international boundary and in Lower California south to the area occupied by *typica*. Standley's *F. longipes* is a form of *lævis* with pedicels slightly longer than usual. No material of this, or any of the previously mentioned varieties, were collected on the expedition. In the north middle section of the gulf there is a minute-leaved form of *lævis* which may be called *Fagonia chilensis* var. *rosei*, n. comb. It appears to be indistinguishable from *F. subaphylla* of northern Chile. Specimens were collected on Tiburon Island (3258) and at San Luis Gonzales Bay (3346). *Fagonia chilensis*, var. *insularis*, comb. nov. is simply a densely glandular-villous state of *rosei* which inhabits the southern gulf islands. It was collected on Coronados (3767), Carmen (3806), and San Francisco (3958) islands. *Fagonia chilensis* var. *glutinosa*, n. comb., which has a synonym in *F. viscosa*, has the leaves of typical *chilensis*, and in addition has long stipules and densely glandular stems. It comes from the Colorado Desert, from northwestern Sonora, where it was collected at Tepoca Bay (3297), and from Guadalupe Point in Concepcion Bay (4155), a station quite incongruous with its other distribution. A difference in leaflet-width is all that separates *Fagonia chilensis* var. *pachyacantha*, n. comb., from the var. *glutinosa*, the former having linear and the latter ovate or oblong leaflets. The variety *pachyacantha* appears to range along the east coast of the peninsula from about Santa Rosalia to San Luis Gonzales Bay. It was collected at San Francisquito Bay (3555) and on Angel de la Guarda Island (3385). *Fagonia*

chilensis var. *palmeri*, n. comb., is the best marked of all the varieties accepted. Though the leaflets are always five in *palmeri* and three in *pachyacantha*, that is the only difference, and it seems that the two forms should be closely associated as varieties of the same species. The type of *F. palmeri* came from Santa Rosalia, but indistinguishable material grows on San Marcos Island (3612).

The forms of *F. chilensis* observed on the expedition were all slender, trailing shrubby plants which grew in gravelly washes or on banks, and formed spreading masses 15-20 cm. high and 6-12 dm. broad. The flowers are pink or somewhat magenta. The plant was found abundantly nowhere.

159a. *Fagonia densa*, n. sp.

A dense, compact, upright, globose shrub 15-80 cm. high; stem very woody, becoming 25 mm. thick, branched 2-4 dm. above the ground into closely ascending branches; branches stout, much branched, with numerous slender green terete ultimate branchlets; internodes short, 5-15, but usually about 10 mm. long; leaves and stipules together appearing as whorled acerose leaves, numerous, crowded, in situ completely hiding the rameal skeleton of the plant, glabrous but more or less glandular and glutinous; leaves with acerose petioles 5-10 mm. long and 3 acerose leaflets 1-6 mm. long; stipules acerose, 10-15 mm. long, ascending, exceeding or slightly shorter than the internodes, simulating in form and color the subtended leaves which they commonly exceed in length; pedicels slender, abruptly reflexed, 2-5 mm. long, glandular glutinous; sepals oblong to lance-oblong, obtuse, 3-5 mm. long; petals pink, 7-8 mm. long, spatulate; fruit 4-5 mm. long, glandular and exceedingly glutinous, more or less sparsely villous, beak very slender and 3-4 mm. long; seeds ovate, minutely and shallowly aveolate.

Type: No. 1285, Herb. Calif. Acad. Sci., collected May 9, 1921, by I. M. Johnston (no. 3532) from gypsum soil in a cañon on South San Lorenzo Island, Gulf of California.

This plant is locally frequent in gypsum soil in the upper reaches of a small cañon which opens on the anchorage off South San Lorenzo Island (3532). The plants first found

were without flowers and fruit and so strange were their habit and appearance that they were generically unrecognizable. They gave not the slightest suggestion of the sprawling lax open habit that characterizes *F. chilensis*, invariably growing in trim close globose very leafy bushes that in form much recalled some of the dwarf lawn conifers. The woodiness, leafiness, and weight of the branches were particularly noticeable and particularly different from those in all forms of *F. chilensis*. Among the American and Old World forms of *Fagonia*, *F. densa* is characterized by its dense, erect, bushy habit, very woody stems with short internodes, acerose stipules that commonly exceed the leaves, and exceedingly glutinous fruits. It suggests in some respects *F. chilensis* var. *pachycantha*, but the habit is completely at variance with that as with all other varieties of *chilensis*.

160. *Guaiacum coulteri* var. *palmeri* (Vail), n. comb.

Guaiacum palmeri Vail, N. Am. Fl. 25:107. 1910.—*Type locality*: Guaymas, Sonora.

Seen only at San Pedro (4326) and San Carlos (4353) bays where it is frequent on gravelly plains and less common on the adjacent hillsides. It is a coarse-stemmed, open shrub 15-30 dm. high and 15 dm. broad, which rarely becomes arborescent, and reaches 4 m. in height. The flowers which appear before the leaves are a rich bluish purple in color and have the petals twisted like propeller blades. Certainly it is one of the most beautiful shrubs in the gulf area. According to Captain Ross it is called "lignum vitæ" and is used by the gulf seamen for the same purposes as the commercial wood.

The variety *palmeri* is characterized by its tomentose ovary. The collections have densely tomentose ovaries, but an isotype of *palmeri* has the ovary only partly tomentose. Perhaps *G. palmeri* is based on characters too unimportant even for a variety.

161. *Larrea divaricata* Cav.

Larrea divaricata Cav., Anales Hist. Nat. Madrid 2:122, t.19, f.l. 1800.—*Covillea divaricata* Vail. Bull. Torr. Cl. 22:229. 1895.—*Zygothllum tridentatum* DC., Prodr. 1:706. 1824.

—*Larrea tridentata* Cov., Contr. U. S. Nat. Herb. 4:75. 1893.
 —*Covillea tridentata* Vail, Bull. Torr. Cl. 26:302. 1899.—
Larrea mexicana Moric., Pl. Nouv. Am. 71. 1839.—*Zygo-*
phyllum californicum Torr. & Fren., Rep. 257. 1845.—
Larrea glutinosa Engelm. in Wisliz., Mem. No. Mex. 93.
 1848.—*Covillea glutinosa* Rydb., N. Am. Fl. 25:108. 1910.—
Type locality: Between Mendoza and Buenos Aires, Argenti-
 na.

Larrea was seen only at the following localities: Tiburon Island, Tepoca Bay (3293), San Luis Island (3323), San Luis Gonzales Bay, Angel de la Guarda Island (3403), San Francisco Bay, Santa Rosalia, San Marcos Island, and Guadalupe Point. It is a many-stemmed, tufted, resinous shrub 8-20 dm. high. When present it is usually common on gravelly plains and rocky slopes. At Santa Rosalia and San Marcos Island it was called "gobernadora" by the natives. The petals of this plant, both in the gulf area and in the deserts of California, are twisted at the short claw so as to have their faces vertical and not horizontal as all the illustrations, drawn from herbarium material, have shown them. When fresh the twisted petals give the flowers the appearance of miniature water-wheels. If there are any characters by which the Argentine forms of *L. divaricata* can be decisively separated from the North American forms of Larrea, they have yet to be pointed out. Every phase of the North American plant finds its duplication in the material from the continent to the south, and there seems no good reason why Cavanilles' name should not be applied to the northern plant.

162. *Viscainoa geniculata* (Kell.) Greene

Viscainoa geniculata Greene, Pittonia 1:163. 1888.—*Staphylea geniculata* Kell., Proc. Calif. Acad. Sci. 2:22. 1859.—
Chitonia simplicifolia Wats. in Orcutt, West. Am. Sci. 2:58. 1886. hyponym.—*Type locality:* North of Santa Rosalia Bay nearly opposite Elide Island, Lower California.

One of the most characteristic and widely distributed shrubs in the gulf area. Not observed on San Pedro Martir, San Pedro Nolasco, Raza, Patos, San Marcos, Coronados, or Danzante islands, but seen at all other stations in and about the gulf

(3052, 3208, 3230, 3269, 3338, 3457, 3582, 4194). The plant is a homely, rather dense, pallid evergreen shrub growing 15-25 or 30 dm. high. It is equally abundant on gravelly situations and on rocky hillsides, and appears particularly to like situations on and about cliffs. The petals are white and crepe-like. Goldman (Contr. U. S. Nat. Herb. 16:346. 1916) and Curran (Proc. Calif. Acad. Sci. II, 1:228. 1888) both have interesting accounts of this species.

XLI. RUTACEÆ

163. *Esenbeckia flava* Brandg.

Esenbeckia flava Brandg., Zoc 1:378, t.12. 1891.—*Type locality*: San José del Cabo, Lower California.

A strictly branched, erect-growing, deciduous shrub or small tree. It grows 2-4 m. high and frequently has a trunk 1-6 dm. high and 15-20 cm. thick. Observed only on San Josef (4087) and Catalina islands where it is locally common on gravelly plains or gravelly cañon floors.

164. *Thamnosma trifoliata*, n. sp.

A glabrous perennial with prostrate, wiry stems 3-6 dm. long; leaves remote, trifoliolate, with slender petioles 1-5 mm. long; leaflets sessile or short petiolate, elliptical or oblong, the outer two more or less oblique, 5-14 mm. long, 3-8 mm. wide, light green above, pale beneath, apex rounded, margins finely crenate; flowers scattered; pedicels 1-4 mm. long; sepals united below, ovate or almost semicircular, 1-1.5 mm. long; flowers unknown; capsules deeply obcordate-lobed, 4-5 mm. high, 4-6 mm. wide, short stipitate or subsessile; ovules about 5 in each cell; seeds 2 in each cell, 2.5 mm. long, a little over 1 mm. in transverse diameter, bent and arched in lateral outline, pallid, densely roughened with uneven coarse fragile tubercules.

Type: No. 1286, Herb. Calif. Acad. Sci., collected May 26, 1921, by I. M. Johnston (no. 3892) in a gulch in the mountains back of **Agua Verde Bay, Lower California.**

Of this very distinct new species there was found but a single fruiting plant. It grew from a rock crevice and trailed

over the bed of a rocky gulch which runs down the side of a huge amphitheater-like cañon in the Sierra Giganta just south of Agua Verde Bay (3892). The trifoliolate leaves and prostrate wiry stems give the plant the general appearance of a species of *Lotus*. When bruised the plant exhaled a rue-like odor.

The nearest relative of *Thamnosma trifoliata* is *T. texana* Gray. It also seems close to *T. africana* Engler. The new species differs from *texana* in its prostrate habit, trifoliolate leaves, and fewer, differently-shaped seeds. *Thamnosma africana* has trifoliolate leaves but it is an erect plant with linear leaflets, a capsule 8-9 mm. high, and 8 seeds which are reniform and echinate. With the new addition, the genus now has five known species, two African and three American.

XLII. SIMARUBACEÆ

165. *Castela peninsularis* Rose

Castela peninsularis Rose, Contr. U. S. Nat. Herb. 12:278. 1909.—*Castelaria peninsularis* Small, N. Am. Fl. 25:231. 1911.—*Type locality*: San José del Cabo, Lower California.

Observed on Catalina, Santa Cruz (3918), San Diego (3928), San Josef (4088), San Francisco, Espiritu Santo (3983), and Ceralbo islands, and at San Evaristo Bay (4090). On San Diego and Santa Cruz islands the plant grows on seaward slopes or about seacliffs forming scraggly flat-topped growths 5-10 dm. high. At other localities it grows in gravelly or rocky soil back from the sea and formed an even, depressed, globose shrub 9-18 dm. high. The fruit is composed of several bright-red, cherry-like drupes which, though appearing appetizing, are in fact very bitter. The pedicels, petals, and sepals are red, but the 8 stamens are yellow. Brandegee (*Zoe* 2:147. 1891 and Proc. Calif. Acad. Sci. II, 3:120. 1891) reports this plant, under the name of *C. tortuosa*, as abundant in the cape region and gives some interesting notes regarding it.

XLIII. BURSERACEÆ

166. *Bursera cerasifolia* Brandg.

Bursera cerasifolia Brandg., Proc. Calif. Acad. Sci. II, 3:121. 1891.—*Terebinthus cerasifolius* Rose, Contr. U. S. Nat. Herb. 10:119. 1906.—*Elaphrium cerasifolia* Rose, N. Am. Fl. 25:244. 1911.—*Type locality*: San José del Cabo, Lower California.

Referred here is the shiny-leaved copal collected on Espiritu Santo (4080) and observed on Ceralbo Island. The habits were those of *B. rhoifolia* from which it differs chiefly in its glabrous, shiny, simple, usually short-petiolate leaves.

167. *Bursera microphylla* Gray

Bursera microphylla Gray, Proc. Am. Acad. 5:155. 1861.—*Terebinthus microphyllus* Rose, Contr. U. S. Nat. Herb. 10:120. 1906.—*Elaphrium microphyllum* Rose, N. Am. Fl. 25:250. 1911.—*Type locality*: Sierras Tule, Sonora.

A characteristic and ubiquitous tree in the gulf area. It was seen at Guaymas, Guadalupe Point, and La Paz (3042); at San Luis Gonzales, Tepoca (3289), Los Angeles (3482), Las Animas, San Francisquito, Coyote (4168), San Nicolas, Escondido, and San Evaristo bays; and on San Pedro Nolasco (3128), Tiburon (3246, 4273), Angel de la Guarda (3391), San Esteban (3186), San Marcos, Coronados, Carmen, Danzante, Monserrate, Catalina, Santa Cruz, San Diego, San Josef, San Francisco, Espiritu Santo, and Ceralbo islands. This plant, called "torote" by the natives, is a heavy-limbed, strong-scented tree which usually grows in gravel but by no means avoids rocky hillsides. Commonly a stout spreading tree 25 dm. high, but frequently forming a tree 75 dm. high. The older limbs have a yellowish oily papery exfoliating outer bark and a dark maroon inner bark. The odor of the tree is very similar to, but much stronger than, the cultivated *Schinus molle*. The southern plants seem to be larger and to have larger leaflets than do the northern plants.

168. *Bursera rhoifolia* (Benth.), n. comb.

Elaphrium rhoifolium Benth., Bot. Sulph. 10, t.10. 1844.—*Terebinthus rhoifolius* Rose, Contr. U. S. Nat. Herb. 10:121. 1906.—*Bursera hindsiana* var. *rhoifolia* Engler in DC., Monog. Phan. 4:59. 1883.—*Elaphrium hindsianum* Benth., Bot. Sulph. 10, t.8. 1844.—*Bursera hindsiana* Engler in DC., Monog. Phan. 4:58. 1883.—*Terebinthus macdougalii* Rose, Torreyia 6:170, f.5. 1906.—*Elaphrium macdougalii* Rose, N. Am. Fl. 25:255. 1911.—*Elaphrium epinatum* Rose, N. Am. Fl. 25:243. 1911.—*Elaphrium goldmani* Rose, N. Am. Fl. 25:256. 1911.—*Type locality*: Magdalena Bay, Lower California.

A widely distributed but not an abundant tree in the gulf area. It was seen at Tepoca Bay (3292), San Luis Gonzales, Los Angeles (3484), Las Animas, and San Nicolas bays; and on Tiburon (3271), San Luis, Angel de la Guarda (3382), Tortuga (3597), Carmen, Catalina, and Santa Cruz islands. The tree grows 25-35 dm. high and has spreading heavy, dark-barked limbs.

This species varies in the number of pinnules developed, its leaves being sometimes simple and sometimes ternate. Bentham named the simple (*hindsiana*) and ternate (*rhoifolia*) forms, but as Brandege (Proc. Calif. Acad. Sci. II, 2:138. 1889) has remarked the leaf variation in this species seems unworthy of recognition. *Elaphrium epinatum* Rose, is one of the simple-leaved forms of *rhoifolia*, and is not a relative of *B. cerasifolia* as its author suggests. The type of *E. goldmani* does not show anything which would separate it from forms referred to *rhoifolia*, although Goldman (Contr. U. S. Nat. Herb. 16:340. 1916) writes that he recognized the plant as different in the field.

XLIV. MALPIGHIACEÆ

169. *Janusia californica* Benth.

Janusia californica Benth., Bot. Sulph. 8; t.4. 1844.—*Type locality*: Magdalena Bay, Lower California.

Infrequent over the higher parts of Tortuga Island (3603) where it forms tangled masses in low shrubs. Flowering specimens were taken from an irrigated garden on Carmen Island (3832).

170. *Janusia gracilis* Gray

Janusia gracilis Gray, Pl. Wright. 1:37. 1852.—*Type locality*: Mountains east of El Paso, Texas.

A wiry vine that grows in stony ground and twines up through bushes forming tangles in their upper branches. It was collected on San Esteban (3207) and Carmen (3838) islands, and at Guaymas (3109) and Mulegé (3696). The only previous record for the peninsula appears to be that of Goldman (Contr. U. S. Nat. Herb. 16:340. 1916) from San Matias Pass.

171. *Mascagnia macroptera* (Moc. & Sesse) Niedenzu

Mascagnia macroptera Niedenzu, Gen. Masc. 27. 1908.—*Hiræa macroptera* Moc. & Sesse in DC., Prodr. 1:586. 1824.—*Type locality*: Near Monterey, Nuevo Leon.

This plant was seen at Guaymas (3096), San Carlos Bay, San Pedro Bay, Santa Rosalia, San Nicolas Bay (3732), Loreto (3773), Carmen Island (3804), Danzante Island, Escondido Bay (3850), Monserrate Island, and Agua Verde Bay. It seems to have no definite habit of growth, appearing in the same locality either as a long trailing or twining vine, or as an erect shrub a meter or less high. It grows most frequently on gravelly soil, especially that of cañon floors, but at Guaymas it grew on a rocky hillside. At Santa Rosalia the plant was notable because of its extreme abundance in the broad rocky wash in the cañon directly back of the town.

172. *Thryallis angustifolia* (Benth.) Kuntze

Thryallis angustifolia Kuntze, Rev. Gen. 1:89. 1891.—*Galphimia angustifolia* Benth., Bot. Sulph. 9, t.5. 1844.—*Type locality*: Cape San Lucas, Lower California.

Found only at San Nicolas Bay (3736). The plant was frequent locally growing in the shelter of shrubs in a sandy wash. The specimens collected have the oblong leaves of the variety *oblongifolia* Vail (Bull. Torr. Cl. 22:228. 1895).

XLV. EUPHORBACEÆ

173. *Acalypha californica* Benth.

Acalypha californica Benth., Bot. Sulph. 51. 1844.—*Type locality*: Magdalena Bay, Lower California.

Collections of *Acalypha* were made on Espiritu Santo (3974) and Tiburon (3274) islands, and at Los Angeles (3427), Las Animas (3517), Coyote (4176), Escondido (4127), and San Pedro (4316) bays. The peninsular *Acalyphæ*, as exemplified by the collected series and by the very large suite accumulated by Mr. Brandegee, show much variation. There are perhaps several different species in the aggregate, but the intricate synonymy and host of close-cut species in the genus, make it inadvisable, at present, to attempt a segregation.

174. *Adelia virgata* Brandg.

Adelia virgata Brandg., Zoe 4:406. 1894.—*Type locality*: Sierra de la Laguna, Lower California.

Collected at San Pedro Bay (4310) and at Escondido Bay (4135), and recognized at Guadalupe Point, San Nicolas Bay, Loreto, San Evaristo Bay, San Josef Island, Espiritu Santo Island, and Ceralbo Island. Besides the type, Brandegee has collections from San José del Cabo and Comondú. It is infrequent in gravelly washes, becoming a slender shrub 15-25 dm. high with few long usually widely spreading branches. The leaves are borne in loose fascicles on the numerous low woolly spurs studding the branches. *Adelia vaseyi* (Coulter) Pax of western Texas seems to be a very close relative of this species.

175. *Cnidoscolus palmeri* (Wats.) Rose

Cnidoscolus palmeri Rose, Contr. U. S. Nat. Herb. 12:282. 1909.—*Jatropha palmeri* Wats., Proc. Am. Acad. 24:76. 1889.—*Type locality*: Mountains about Guaymas, Sonora.

This is a weak, rather open, shrub usually 9-15 dm. high which seems to be restricted to rock crevices, particularly on rocky cañon sides. The leaves are nearly semicircular in outline and light green in color. The stems and leaves of the plant are more or less abundantly provided with long stinging hairs. When coming in contact with the skin these hairs feel like hot needles and later cause an aggravating itch. The calyces are white, tinged with green. The species was collected at Danzante Island (3863), Agua Verde Bay (3886), Santa Cruz Island (3919), Espiritu Santo Island (3996), and Ceralbo Island (4061). Previously known only from the type collection and from Goldman's (Contr. U. S. Nat. Herb. 16:341. 1916) collections from near San Ignacio. It occurred in fair abundance at every locality where found, but was particularly common about the Isthmus on Espiritu Santo Island.

176. *Croton californica* Muell. Arg.

Croton californica Muell. Arg. in DC., Prodr. 15²:691. 1862.—*Croton arenicola* Rose & Standley, Contr. U. S. Nat. Herb. 16:12. 1912.—*Type locality*: Near San Francisco, California.

Found on the dunes and in sandy draws at Tepoca Bay, San Luis Gonzales Bay (3345), Tiburon Island (3261, 4249), Kino Point, San Pedro Bay (4323), Monserrate Island, and La Paz.

177. *Croton magdalenæ* Millsp.

Croton magdalenæ Millsp., Proc. Calif. Acad. Sci. II, 2:220. 1889.—*Type locality*: Magdalena Island.

An erect, white, tomentose shrub 10-22 dm. high which commonly grows on rocky cañon floors. It was noted on Carmen (3809), Danzante, Monserrate, Santa Cruz, San Diego, San Josef, San Francisco, Espiritu Santo (3970), and Ceralbo (4055) islands; and at Escondido (4125), Agua Verde (3890), and San Pedro (4301) bays.

178. *Ditaxis brandegei* (Millsp.) Rose & Standley

Ditaxis brandegei Rose & Standley, Contr. U. S. Nat. Herb. 16:13. 1912.—*Argythamnia brandegei* Millsp., Proc. Calif. Acad. Sci. II, 2:220. 1889.—*Type locality*: San Gregorio, Lower California.

A very open, shrubby plant 10-25 dm. high with but few widely spreading elongate branches. The stems are very coarse, glabrous, pale green, and usually bear foliage only a short distance (10-15 cm.) below the growing tip. The trunk of the plant, which is 1-2 cm. thick and 3-10 dm. high, is decidedly woody, but the coarse rubbery-appearing branches, which are 5-9 mm. thick, are pithy. All parts of the plant turn purplish on drying. The plant usually selects gravelly soil in cañons, but it also grows in gypsum and on rocky hillsides. It was generally common at no locality, usually occurring in varying abundance in small areas at each station. It was seen at the following localities,—Angel de la Guarda Island (3402), San Marcos Island (3628), Mulegé (3693), Guadalupe Point (4157), Coyote Bay (4170), San Nicolas Bay (3733), Coronados Island (3764), Loreto (3794), Carmen Island (3818), Escondido Bay (3847), and Agua Verde Bay (3911). The collections from Guadalupe Point, San Nicolas Bay, Coronados Island, and Carmen Island differ from the others in having the fruit covered with yellowish appressed hispid hairs and in having similar hairs scattered over the foliage. This pubescent form, which may be called *D. brandegei* var. *intonsa* (*type*,—*Johnston 3764*, No. 1286_a, Herb. Calif. Acad. Sci.), is the only conspicuous variation of the species. The species commonly has 10 stamens placed in two series, and seems clearly to belong near *D. cyanophylla* in the monograph by Pax (*Pflanzenr.* 4¹⁴⁷vi :66. 1912), for the flowers are borne in well developed racemes characteristic of the section Serophyton of that work. It should be noted, however, that Pax has reversed the proper application of *Aphora* and Serophyton, the type species of these sections not occurring under the sections which they typify.

179. *Ditaxis lanceolata* (Benth.) Pax & Hoffm.

Ditaxis lanceolata Pax & Hoffm., Pflanzenr. 4¹⁴⁷ VI :71. 1912.—*Serophyton lanceolatum* Benth., Bot. Sulph. 52. 1844.—*Argythamnia sericophylla* Gray in Wats., Bot. Calif. 2:70. 1880.—*Ditaxis sericophylla* Heller, Cat. N. Am. Pl. 5. 1898.—*Argythamnia sericophylla* var. *verrucosemina* Millsp., Proc. Calif. Acad. Sci. II, 2:221. 1889.—*Type locality*: Magdalena Bay, Lower California.

This is a monœcious perennial with a coarse taproot, a twiggy caudex, and a crown of numerous slender subsimple silky branches. It grows selfsupporting or up through other plants, and though occasionally widely spreading or subprostrate it is usually strictly or ascendingly branched and 2-9 dm. high. It grows usually in gravelly or sandy washes but occasionally also on rocky hillsides. Collections were made at Angel de la Guarda Island (3390, 4209), San Esteban Island (3206), San Francisquito Bay (3578), Mulegé (3698), San Nicolas Bay (3726), Espiritu Santo Island (3973, 4008), and La Paz (3036). A study has been made of a photograph of the type of *Serophyton lanceolata* and of toptype material, and it is found that these differ from *Argythamnia sericophylla*, the type of which has been seen, only in a slightly greater breadth of leaf. This sole difference is entirely obliterated by perfect intergradation in the suite of specimens studied.

180. *Ditaxis serrata* (Torr.) Heller

Ditaxis serrata Heller, Cat. N. Am. Pl. 5. 1898.—*Aphora serrata* Torr., Bot. Mex. Bound. 197. 1858.—*Argythamnia serrata* Muell. Arg., Linnæa 34:147. 1865.—*Ditaxis odontophylla* Rose & Standley, Contr. U. S. Nat. Herb. 16:12. 1912.—*Argythamnia serrata* var. *magdalena* Millsp., Proc. Calif. Acad. Sci. II, 2:221. 1889.—*Type locality*: Near Fort Yuna, Arizona.

Forming prostrate growths in gravelly or sandy places, and frequently also on rocky hillsides. It is usually annual, but not infrequently becomes perennial. As treated here the species is probably an aggregate. The material from San Luis Gonzales Bay (3332), Angel de la Guarda Island (3356, 4217,

4240, 4410), San Esteban Island (3180), Tiburon Island (4266), South San Lorenzo Island (3531), Tortuga Island (3595), San Marcos Island (3643), Mulegé (3697), and Guadalupe Point (4156), all seem to be quite similar to the Californian plants. Most of the material from California has subentire, acute, oblong-lanceolate, or -oblanceolate leaves, developments which the cited material shows. Among the plants mentioned the material from Angel de Guarda, San Esteban, and South San Lorenzo islands seems to be perennial, to grow larger, and to have narrower leaves. The specimen from San Marcos Island has a notably dense pubescence. Plants collected along the Sonoran coast at Tepoca Bay (3291), Tiburon Island (3255), and Kino Point (4289) show a tendency to be sparsely pubescent and to have the leaves obtuse and drying reddish. Specimens from San Francisquito Bay (3553) have obtuse leaves which are serrate on the end, and have seeds with granulate surfaces. As to seeds, leaf-margin, and leaf-shape, this latter collection is *Ditaxis serrata* var. *magdalena*, but the type of that variety has green, very large (25-40 mm. long), sparsely pubescent leaves, whereas the San Francisquito plant has leaves half as large, canescent, and densely pubescent. The meagre material at hand seems to show that most of the plants in the south of the peninsula have obtuse leaves with terminal serrations. These southern plants, however, vary considerably in pubescence, size of leaf, and marking of the seed. Completing the collected series is a form from La Paz (3073) with reddish lanceolate leaves and dense long spreading hispid pubescence.

181. *Euphorbia arizonica* Engelm.

Euphorbia arizonica Engelm. in Torr., Bot. Mex. Bound. 186. 1859.—*Euphorbia bartholomæi* Greene, Pittonia 1:290. 1889.—*Chamæsyce bartholomæi* Millsp., Pub. Field Mus. Bot. 2:408. 1916.—(?) *Euphorbia pondii* Millsp., Contr. U. S. Nat. Herb. 1:12. 1890.—*Type locality*: Sierra Yanos, Sonora.

This species, characterized by its loose habit, sparse spreading pubescence, and large white or frequently pink involucrel

appendages, is very frequent on a broad cañon floor at Agua Verde Bay (3878). Brandegees has collections from the Sierra de la Laguna, and from Natividad Island. *Euphorbia pediculifera* var. *minor* Millsp. (Proc. Calif. Acad. Sci. II, 2:227. 1889) has the habits of this species but its appendages are much reduced. It does not, however, have anything to do with *E. pediculifera*.

182. *Euphorbia capitellata* Engelm.

Euphorbia capitellata Engelm. in Torr., Bot. Mex. Bound. 188. 1859.—*Chamaesyce capitellata* Millsp., Pub. Field Mus. Bot. 2:408. 1916.—*Euphorbia capitellata* var. *laxiflora* Wats., Proc. Am. Acad. 24:74. 1889.—*Type locality*: Valley of San Bernardino, Sonora.

Very common and erect-growing on the rocky hills about Coyote Bay (4173). At San Carlos Bay (4369) it was infrequent and prostrate in a wash. A small colony was also found on a railroad embankment at Guaymas (3120).

183. *Euphorbia carmenensis* Rose

Euphorbia carmenensis Rose, Contr. U. S. Nat. Herb. 1:133. 1892.—*Chamaesyce carmenensis* Millsp., Publ. Field Mus. Bot. 2:408. 1916.—*Type locality*: Carmen Island.

Apparently most at home in decomposed granite on hillsides and on benches, but also occurring in washes and on dunes. It is a plant with a depressed shrubby base and forms flat circular growths 8-30 cm. broad and 3-8 cm. high. Collected on Carmen (3800, 3842), Catalina (4103), Santa Cruz (3921), and San Diego (3925) islands. At all localities the plant was heavily infested with cecidomyid galls. The San Diego collections have evident white involucreal appendages; the others are unappendaged. The species has a distinct aspect but is hard to separate from some forms of *E. polycarpa*, the best characters being the occurrence of galls, island range, small oblong leaves, and a peculiar flattened shrubby habit.

184. *Euphorbia ceroderma*, n. sp.

A leafless, yellow-green perennial forming broad dense erect clumps 5-10 dm. high; stems numerous, 4-6 mm. thick, covered with a thick wax coat, with one or two strictly ascending branches; involucre in small subsessile glomerules borne along the stem, yellow, unisexual by abortion, turbinate, glabrate, about 1 mm. high, lobes none, with 5 transversely oblong conduplicate yellow glands which have evident yellow acute ovate or cordate irregularly-margined appendages 1-1.5 mm. long; female involucre few, with small appendages and pedicels with 3 conspicuous slender reddish compressed whip-like bracts 12-18 mm. long; ovary glabrous; style divided.

Type: No. 1287, Herb. Calif. Acad. Sci., collected July 7, 1921, by I. M. Johnston (no. 4304) from rocky cañon sides at **San Pedro Bay, Sonora**.

Apparently related to *E. antisiphylitica* with which it agrees in habit, but from which it differs in its wax-coated stems, much smaller glomerate glabrous involucre, and in its widely separated range. The filiform bracts are similar to those in the very different *E. dioscoreoides* while the habit suggests that of a slender plant of *Pedilanthus macrocarpus*. The new species is common on the rocky cañon sides about San Pedro Bay (4304), and is very abundant on the rocky volcanic slopes about San Carlos Bay.

185. *Euphorbia chamberlini*, n. sp.

A perennial 10-15 cm. high with erect or ascending slender herbaceous stems which are mainly branched below, young parts sordid with a dense oily villous pubescence, old parts sparsely short-villous; leaves opposite, ovate, entire, apex obtuse, base rounded or slightly cordate, old leaves becoming roseate glabrate and a little glaucous, blade 5-8 mm. long and 4-6.5 mm. wide, petiole 0.5-2.0 mm. long; stipules united to form a deltoid scale which is frequently bifid with acuminate lobes; involucre aggregated into close very leafy capitate clusters terminating branches or branchlets, turbinate, pubescent outside, 1.2 mm. long, with 5 linear lobes and 4 appendaged glands; glands reddish-brown, rather small, short-oblong; involucreal appendages white, less than 3 mm. long and

1 mm. wide, deeply lobed; capsule pubescent, spherical-ovate, about 1.2 mm. long, obtusely 3-angular; seeds ashy, prismatic, 1 mm. long, smooth on the faces transversely wrinkled.

Type: No. 1288, Herb. Calif. Acad. Sci., collected June 14, 1921, by I. M. Johnston (no. 4136) on an alluvial plain at **Escondido Bay, Lower California.**

Frequent in gravelly soil among bushes on the detrital plain near the foot of the Sierra Giganta back of Escondido Bay (4136). This is a well-marked species whose outstanding characters are its lobed involucreal appendages and capitate inflorescence. It suggests *E. pycnanthema*, but differs in its smaller, entire leaves and lobed appendages. From *E. capitellata*, which is probably its nearest relative, it differs in habit, pubescence, shape of leaves, and smaller lobed appendages. The species is named for Joseph Chamberlin, companion of the author when the type was collected while tramping boatward after an eventful day spent high in the Sierra Giganta.

186. *Euphorbia eriantha* Benth.

Euphorbia eriantha Benth., Bot. Sulph. 51. 1844.—*Poinsettia eriantha* Rose & Standley, Contr. U. S. Nat. Herb. 16:13. 1912.—*Type locality:* Magdalena Bay, Lower California.

Collected in washes at Angel de la Guarda Island (4208), Tiburon Island (4255), Los Angeles Bay (3478), and San Francisquito Bay (3576). It was noted as very common on the rocky hillsides about Coyote Bay. The plant was very common at Coyote Bay and at the south end of Angel de la Guarda Island, but elsewhere only a few scattered plants were seen. It is an annual with one to several strict stems 2-3 dm. high or occasionally even 8 dm. in height.

187. *Euphorbia hypericifolia* L.

Euphorbia hypericifolia L., Sp. Pl. 454. 1753.—*Chamaesyce hypericifolia* Millsp., Pub. Field Mus. Bot. 2:302. 1909.—*Type locality:* West Indies.

A common weed in the cultivated fields at Mulegé (3673). Brandegee has collections from Purisima, west side of Cape

Region, Todos Santos, and Cañon San Bernardo. Narrow-leaved plants referable to *E. brasiliensis*, have been repeatedly collected about San José del Cabo.

188. *Euphorbia incerta* Brandg.

Euphorbia incerta Brandg., Proc. Calif. Acad. Sci. II, 3:171. 1891.—*Chamaesyce incerta* Millsp., Pub. Field Mus. Bot. 2:409. 1916.—*Type locality*: El Mogote opposite La Paz, Lower California.

Collected on San Francisco Island (3944) where frequent on a sand-beach forming a narrow belt along the high-tide line, and at La Paz (4010) where a populous colony was found on the dunes of El Mogote. It is a coarse herbaceous plant of variable habit. On the island the stems were prostrate and buried in the sand with only the foliage and branchlets exposed, but at La Paz the stems were strict or ascending and unburied. The stems are covered with a thick even coat of gluten which is usually holding sand grains to its full capacity.

189. *Euphorbia leucophylla* Benth.

Euphorbia leucophylla Benth., Bot. Sulph. 50. 1844.—*Chamaesyce leucophylla* Millsp., Pub. Field Mus. Bot. 2:410. 1916.—*Euphorbia velutina* Greene, Bull. Calif. Acad. Sci. 2:57. 1886.—*Euphorbia biserrata* Millsp., Zoe 1:347. 1891.—*Type locality*: Cape San Lucas, Lower California.

Seen only at Kino Point (4283), Tiburon Island (4246), La Paz (4009), and Ceralbo Island (4021), at all of which stations it was locally common on dunes along the ocean. The plant is perennial and forms circular mats 2-6 dm. broad. The stems are widely ascending and the plant may become 15 cm. high, but usually the stems are buried in the sand and the plant is only a few centimeters in height. Brandegees (Proc. Calif. Acad. Sci. II, 3:168. 1891) has very full notes on this species.

190. *Euphorbia magdalenæ* Benth.

Euphorbia magdalenæ Benth., Bot. Sulph. 50. 1844.—*Chamaesyce magdalenæ* Millsp., Pub. Field Mus. Bot. 2:410. 1916.—*Euphorbia blepharostipula* Millsp., in Vasey & Rose,

Contr. U. S. Nat. Herb. 1:77. 1890.—*Euphorbia watsoni* Millsp., Zoe 1:347. 1891.—*Chamaesyce watsoni* Millsp., Pub. Field Mus. Bot. 2:412. 1916.—*Type locality*: Magdalena Bay, Lower California.

A dense, slender-stemmed shrub forming globose bushes 4-10 dm. high. It grows most commonly in gravelly soil, but is not infrequent on rocky hillsides. The involucre are frequently deformed to form elongate cylindrical structures. According to Mr. Van Duzee these are characteristic cecidomyid galls. On Cerralbo Island the plants were so browsed that they formed prostrate mats. The plant was seen on San Marcos (3647), Coronados, Carmen (3819, 3828), Danzante, Monserrate, Santa Cruz, San Diego (3931), San Josef, San Francisco (3960), Espiritu Santo (3997), and Cerralbo (4047, 4061) islands; and at Mulegé (3661), Coyote Bay, Guadalupe Point (4153), San Nicolas Bay, Loreto, Escondido Bay, Agua Verde Bay, and La Paz (3035). It was also seen at San Pedro Bay in Sonora. *Euphorbia blepharostipula* from La Paz, and *E. watsoni* from Todos Santos are practically identical with material from Magdalena Bay.

191. *Euphorbia misera* Benth.

Euphorbia misera Benth., Bot. Sulph. 51. 1844.—*Trichostigma miserum* Kl. & Garcke, Abh. Akad. Berlin 1859¹:41. 1860.—*Euphorbia benedictum* Greene, Pittonia 1:263. 1889.—*Trichostigma benedictum* Millsp., Addisonia 2:3, t.42. 1917.—*Type locality*: San Diego, California.

A stout, rather flexible-stemmed, erect-growing, very lactiferous shrub 6-12 dm. high. It was seen only at Tepoca Bay (3308) where it was common on the stony gently sloping plain back of the beach, and on San Marcos Island (3624) where it was frequent in a gypsum ravine. *Euphorbia misera* differs from *E. californica* Benth., the type of which came from Magdalena Bay, only in its pubescence, usually coarser stems, and generally more northerly range. The habit-difference is not always positive and some pubescent plants are slender-stemmed. Brandegee has a specimen, definitely referred to *E. hindsiana* by Millspaugh (Zoe 1:348. 1891), which comes from Magdalena Island and which is as pubescent as topotypes of *E. misera*

from San Diego. Furthermore the original plate of *E. californica* (Bot. Sulph. t. 23b) shows pubescence on the leaves and involucre. It is evident, therefore, that satisfactory characters for the differentiation of *E. misera* and *E. californica* have yet to be pointed out.

192. *Euphorbia pediculifera* var. *involuta* (Millsp.), n. comb.

Euphorbia involuta Millsp., Proc. Calif. Acad. Sci. II, 2:227. 1889.—*Chamaesyce involuta* Millsp., Pub. Field Mus. Bot. 2:410. 1916.—*Euphorbia conjuncta* Millsp., Proc. Calif. Acad. Sci. II, 2:227. 1889.—*Chamaesyce conjuncta* Millsp., Pub. Field Mus. Bot. 2:408. 1916.—*Type locality*: Comondú, Lower California.

This variety was collected at San Luis Gonzales Bay (3331), Angel de la Guarda Island (4216), Tiburon Island (4265), San Marcos Island (3641), Coyote Bay (4412), Agua Verde Bay (3879), and Espiritu Santo Island (3991a). It is a canescent prostrate herbaceous plant usually growing in sandy washes. At San Marcos Island it was called "golondrina". Millspaugh's two species are evidently the same, and at best represent a small narrow-leaved form of *pediculifera*. Watson's variety *linearifolia* (Proc. Am. Acad. 24:76. 1889) from Guaymas, differs from *involuta* in its much larger leaves, glabrate stems and foliage, and much more open habit of growth. The variety *involuta* seems to be the peninsular form of *E. pediculifera*, and, like the typical form, is characterized by cylindrical seeds with several strong encircling ridges.

193. *Euphorbia polycarpa* Benth.

Euphorbia polycarpa Benth., Bot. Sulph. 50. 1844.—*Chamaesyce polycarpa* Millsp., Pub. Field Mus. Bot. 2:411. 1916.—*Euphorbia purisimana* Millsp., Proc. Calif. Acad. Sci. II, 2:225. 1889.—*Chamaesyce purisimana* Millsp., Pub. Field Mus. Bot. 2:411. 1916.—*Euphorbia brandegeei* Millsp., Proc. Calif. Acad. Sci. II, 2:226. 1889.—*Chamaesyce brandegeei* Millsp., Pub. Field Mus. Bot. 2:408. 1916.—(?) *Euphorbia pediculifera* var. *minor* Millsp., Proc. Calif. Acad. Sci. II, 2:227. 1889.—*Type locality*: Magdalena Bay, Lower California.

The satisfactory delimitation of this species is extremely difficult, and, though the present treatment is the result of several days' study, it is far from satisfying. The species is highly variable, presenting forms that vary from small to large, herbaceous to shrubby, slender to stout, and glabrous to variously pubescent, and have involucre varying from appendaged to unappendaged. It is evident that either a host of trivial "new species" should be described or that the accepted concept should be broadened to allow for more variation. The latter course is chosen.

Typical *E. polycarpa*, judging from topotypes accumulated by Mr. Brandegee, is an open, very slender, almost delicate, prostrate, herbaceous, glabrous plant with evident white involucre appendages. Millspaugh's *E. brandegei*, from the type locality of *E. polycarpa*, seems to be exactly typical *E. polycarpa*, and the same seems also true of *E. purisimana*. *Euphorbia pediculifera* var. *minor* has nothing to do with *pediculifera*, but appears rather to be a *polycarpa* ally. It differs from the slender forms of *polycarpa* in its short-villous vegetative parts.

As here taken, *E. polycarpa* is not restricted to the slender form mentioned, which seems to occur only on and about the Magdalena Plain, but also includes the stouter forms common in the cape region as well as indistinguishable plants from southern California. These plants are glabrous or practically so, sometimes inconspicuously glandular, and frequently glaucous. In the gulf area this type of plant was found only south of Tortuga Island (3594), the region north of that point being occupied by forms which are quite pubescent. The series collected is very uniform. The most outstanding variation being a collection from Carmen Island (4148) which grew on the dunes at the Saltworks and became shrubby, forming rounded growths 37 cm. high and 5 dm. broad. Two collections from a hillside on Espiritu Santo Island (3977, 4005) have become somewhat shrubby below and simulate, if, indeed, they do not actually approach, *E. carmenensis*. The common forms found in the gulf area grew in sandy or gravelly soil producing herbaceous mats 5-35 cm. broad. (3056, 3072, 3594, 3666, 3679, 3717, 3792, 3867, 3945, 3991, 4022, 4044, 4082, 4088, 4152, 4166, 4325.)

194. *Euphorbia polycarpa* var. *hirtella* Boiss.

Euphorbia polycarpa var. *hirtella* Boiss. in DC., Prodr. 15²:44. 1862.—*Chamaesyce polycarpa* var. *hirtella* Millsp. in Parish, Carnegie Inst. Wash. Pub. 193:110. 1913.—*Chamaesyce tonsita* Millsp., Pub. Field Mus. Bot. 2:412. 1916.—*Type locality*: Given as "California", but probably along the Gila River in Arizona.

Perhaps this variety is restricted unduly in making it include only those non-insular plants of the northern gulf region which have a more or less dense spreading grayish pubescence. As here taken, the variety *vestita* differs only in its more densely appressed white pubescence, and the variety *petrina* differs only in its generally brown color and lack of involucreal appendages. The varietal name "*hirtella*" is with doubtful propriety applied to the present concept. The type of the variety *hirtella* is the Emory collection (cf. Bot. Mex. Bound. 186. 1858) given as having come from the Gila River Valley, a locality from which only material of the variety *vestita* has been seen. At any rate, the plants referred to *hirtella* are similar to those of the species in habits, affecting sandy or gravelly soil and forming prostrate mats. Material was collected at San Marcos (3639, 3642, 4180), San Luis (3316), and Tiburon (3262, 4264) islands; and from San Francisquito (3567), Las Animas (3495), Los Angeles (3447), San Luis Gonzales (3330), and Tepoca (3307) bays. Parish (10830) has similar material from Cottonwood Springs in the Colorado Desert.

195. *Euphorbia polycarpa* var. *petrina* (Wats.), n. comb.

Euphorbia petrina Wats., Proc. Am. Acad. 24:75. 1889.—*Chamaesyce petrina* Millsp., Pub. Field Mus. Bot. 2:411. 1916.—*Type locality*: San Pedro Martir Island.

The claim of this form to the rank of variety, to say nothing of species, is very weak. The only characters by which it can be separated from the variety *hirtella* are its small unappendaged involucre and brown instead of grayish color of the whole plant. These characters, particularly the first mentioned, separate the plants from San Pedro Martir (3155), South San Lorenzo (3531), Angel de la Guarda (3363, 3404, 4213, 4239, 4417), San Esteban (3169), Partida (3237), and

Sal si Puedes (3524) islands and as well a peninsular specimen collected by Brandegee at San Esteban. The segregation, however, is not always sharp and the characters not always concomitant; for example, in the Sal si Puedes specimens, the appendages are lacking and the leaves are grayish instead of brown in color. With two exceptions (4213, 4417) the specimens from San Esteban, South San Lorenzo, and Angel de la Guarda islands all hugged the ground very closely and have stiff absolutely prostrate stems and minute crowded brown leaves. The variety commonly grows in rocky ground on hill-sides.

The following synopsis shows the relations and characters of the peninsular Euphorbias constituting the section Anisophyllum:

Leaf margins serrate, crenate, or at least not entire.

Annual herbs.

Plants prostrate; leaves small, 4-8 mm. long.....*E. hirtula*

Plants erect or ascending; leaves 8-40 mm. long.

Involucres few, appendages lacerate; leaves 8-14

mm. long.....*E. dcniosa*

Involucres glomerate, appendages entire; leaves 15-40 mm. long.

Leaves oblong, 8-17 mm. broad.....*E. hypericifolia*

Leaves linear or falcate, 4-6 mm. broad.....*E. brasiliensis*

Perennials.

Involucres conspicuously appendaged, loosely arranged in axils of upper leaves; canescent seashore plants with decumbent or widely spreading herbaceous stems.....*E. leucophylla*

Involucres inconspicuously appendaged, in definite capitate clusters; brownish hillside plants with erect or ascending branches.

A small shrub 2-8 dm. high; inflorescence loose;

plant not simulating a labiate.....*E. tomentulosa*

A tufted plant 1-2 dm. high; inflorescence very

dense; plant simulating a labiate.....*E. pycnanthema*

Leaf margins entire.

A bushy dense shrub 4-10 dm. high.....*E. magdalene*

Lowly herbaceous annuals or perennials, only occasionally woody below.

Seeds globose, smooth; stems coarse, decidedly

glutinous; seashore.....*E. incerta*

- Seeds prismatic or cylindrical, usually definitely rugose; stems slender, not glutinous.
- Seeds cylindrical, completely encircled by 4 strong grooves *E. pedunculifera*
- Seeds prismatic, not completely encircled by grooves.
- Leaves large, 8-28 mm. long, 4-12 mm. wide..... *E. peninsularis*
- Leaves small to middle-sized, always less than 1 cm. long and 8 mm. wide.
- Involucres in capitate clusters.
- Plants glabrate, slender; leaves oblong; appendages entire..... *E. capitellata*
- Plants hirsute, stouter; leaves ovate; appendages lobed..... *E. chamberlini*
- Involucres loosely arranged, not crowded into capitate clusters.
- Annuals; appendages lacerate..... *E. schizoloba*
- Perennials; appendages entire.
- Leaves oblong, 2-6 mm. long, 1-2 mm. wide; plants usually with cecidomyid galls... *E. carmenensis*
- Leaves ovate to oblong-ovate, 2-11 mm. long, 1.5-8 mm. wide; plants uninfested by cecidomyids.
- Pubescence rather sparse, spreading; appendages large, usually colored..... *E. arizonica*
- Pubescence if present rather short and dense.
- Plant glabrate *E. polycarpa*
- Plant evidently pubescent.
- Pubescence appressed, clean and white ... *E. p. vestita*
- Pubescence spreading, sordid or dark.
- Appendages evident; plant ashy..... *E. p. hirtella*
- Appendages lacking; plant brownish .. *E. p. petrina*

196. *Euphorbia tomentulosa* Wats.

Euphorbia tomentulosa Wats., Proc. Am. Acad. 22:476. 1887.—*Chamaesyce tomentulosa* Millsp., Pub. Field Mus. Bot. 2:412. 1916.—*Type locality*: Rosario, Lower California.

A small, erect-growing, flat-topped, rather open bush 2-8 dm. high, which is of infrequent occurrence on hillsides, rocky benches, and gravelly washes. It was seen on Tiburon (4276), Carmen (3801, 4147), and Espiritu Santo (3993) islands; and at San Carlos (4371), San Pedro (4324), Coyote (4174, 4175), San Nicolas (3727), Loreto (3783), and San Evaristo (4094) bays.

197. *Euphorbia xanti* Engelm.

Euphorbia xanti Engelm. in Boiss., DC., Prodr. 15²:62. 1862.—*Euphorbia gymnoclada* Engelm., Proc. Am. Acad. 5:171. 1861.—*Aklema xanti* Millsp., Pub. Field Mus. Bot. 2:417. 1916.—*Type locality*: Cape San Lucas, Lower California.

Collected only at San Francisquito Bay (3551, 3559) and on Tortuga Island (3609), where at the former station it was infrequent and local along a shallow sandy draw near the shore, and at the latter very abundant on lava slopes about the east rim of the crater. A few bushes were seen in sandy soil at San Nicolas Bay and some on a cañon side in the Sierra Giganta back of Escondido Bay. It is usually a more or less erectly-branched, broom-like shrub 15-25 dm. high, but at times divaricately branched and forming low rounded bushes, or more frequently supported by brush or cacti and forming intricate globose masses a meter or more above ground. The leaves are glabrous, ternate, early deciduous, and vary from linear to ovate in outline. The involucreal appendages are white at first, but later turn pink.

198. *Jatropha canescens* Muell. Arg.

Jatropha canescens Muell. Arg. in DC., Prodr. 15²:1079. 1866.—*Mozinna canescens* Benth., Bot. Sulph. 52, t. 25. 1844.—*Type locality*: Magdalena Bay, Lower California.

A shrub or small tree with ascending branches, 15-35 dm. high. The plant is typical of sandy soils. Its rather flexible branches appear to drop their leaves during the summer months. On the peninsula it was frequent northward at least to Loreto (3782). In Sonora it was seen at Kino Point (4288), San Pedro Bay, San Carlos Bay (4355), and Guaymas.

199. *Jatropha spathulata* var. *sessiliflora* (Hook.) Muell. Arg.

Jatropha spathulata var. *sessiliflora* Muell. Arg. in DC., Prodr. 15²:1082. 1866.—*Mozinna spathulata* var. *sessiliflora* Hook., Icones 4: t. 357. 1841.—*Type locality*: Zacatecas.

Ubiquitous in the gulf area, growing with equal frequency in alluvial soils and on hillsides. It is an open shrub 14-18 dm. high composed of rather numerous ascending stems which are loosely branched and form a flat top. The limbs are quite flexible and the twigs are heavily spurred. The juice is brownish. The leaves being shed after the growing season, only naked plants were found. A few flowers were seen at San Pedro Bay (4328) where they had appeared following a light shower that had occurred a week previous. The shrub was usually common at each station, but was not found on the following islands,—San Pedro Nolasco, San Pedro Martir, Patos, Georges, San Luis, Raza, Sal si Puedes, North San Lorenzo, Santa Inez, and Ildefonso.

200. *Manihot angustiloba* (Torr.) Muell. Arg.

Manihot angustiloba Muell. Arg. in DC., Prodr. 15²:1073. 1866.—*Janipha manihot* var. *angustiloba* Torr. Bot. Mex. Bound. 199. 1857.—*Type locality*: Santa Cruz, Sonora.

A lactiferous, weak, very openly and little branched shrub 9-12 dm. high. A few plants were found growing on the bed of a narrow cañon at San Carlos Bay (4738).

201. *Pedilanthus macrocarpus* Benth.

Pedilanthus macrocarpus Benth., Bot. Sulph. 49, t. 23a. 1844.—*Hexadenia macrocarpa* Kl. & Garcke, Abh. Akad. Berlin 1859¹:107. 1860.—*Type locality*: Magdalena Bay, Lower California.

A coarse-stemmed leafless plant which forms rank clumps 6-12 dm. high. It occasionally grows in sandy soil but appears to prefer rocky hillsides. The plant is very milky and is difficult to dry. The involucre and fruit are bright red. It was noted at La Paz, Espiritu Santo Island, San Evaristo Bay, San Nicolas Bay, San Francisquito Bay (3549), and San Pedro Nolasco Island (3124).

202. *Sapium biloculare* (Wats.) Pax

Sapium biloculare Pax in Engler, Pflanzenr. 4^{11v}:153. 1912.
—*Sebastiania bilocularis* Wats., Proc. Am. Acad. 20:374. 1885.
—*Type locality*: Between Rayon and Ures, Sonora.

Found at Guaymas (3098), San Carlos Bay, San Pedro Bay (4332), and Tiburon Island (4277). At Guaymas growing on a steep hillside, but at the other stations on gravelly washes. It is an upright shrub or small tree 17-30 dm. high, and seemed to be nowhere abundant.

203. *Sapium biloculare* var. *amplum*, n. var.

Leaves large, blade 4-7 cm. long and 1-3 cm. wide; spikes usually longer than in the species.

Type: No. 1289, Herb. Calif. Acad. Sci., collected May 19, 1921, by I. M. Johnston (no. 3772) on a sandy plain at Loreto, Lower California.

This plant was seen only at Guadalupe Point (4161), Loreto (3772), and Agua Verde Bay where it grew on gravelly plains and formed a large shrub or small tree 25-45 dm. high. At Loreto it was called "yerba de flecha" and was the only green tree left untouched by woodcutters and cattle. This variety includes all the peninsular plants formerly referred to the species, and of which Goldman (Contr. U. S. Nat. Herb. 16:343. 1916) has given interesting data. It differs from the Sonoran plant in having leaves at least twice as large and proportionately much broader, and in having its spikelets averaging a little longer.

XLVI. BUXACEÆ

204. *Simmondsia chinensis* (Link) Schneider

Simmondsia chinensis Schneider, Ill. Handb. Laubholz. 2:141. 1907.—*Buxus chinensis* Link, Enum. Pl. 2:386. 1822.
Simmondsia californica Nutt., London Jour. Bot. 3:400, t. 16. 1844.—*Brocchia dichotoma* Mauri, Cat. Ort. Napol. 80. 1845.
—*Simmondsia pabulosa* Kell., Proc. Calif. Acad. Sci. 2:21. Jan. 1860.—*Galphimia pabulosa* Kell., Hesperian 4: plate fac-

ing p. 392. Nov. 1860.—*Type locality*: Given as doubtfully from China, but probably from San Diego, California.

A common and wide-spread, but not very conspicuous, shrub 10-15 dm. high. It frequents gravelly cañon floors and rocky slopes. On the peninsular side of the gulf (3580, 4403) it was seen at practically every station south of Los Angeles Bay, and on the Sonoran side at Guaymas, San Pedro Nolasco Island (3129), San Pedro Bay, Kino Point, and Tiburon Island (3275).

Link's misleading name unmistakably applies to our plant and as it is over 20 years older than Nuttall's there seems to be no other course than to accept it. Link described his plant as having solitary female flowers with lanceolate sepals, characters which exclude it from *Buxus* and clearly show its application to *Simmondsia*. Further proof of its identity is found in the fact that Mueller (DC., Prodr. 16:23. 1869), who saw authentic material pronounced *S. chinensis* and *S. californica* to be the same.

XLVII. ANACARDIACEÆ

205. *Cyrtocarpa edulis* (Brandg.) Standley

Cyrtocarpa edulis Standley, Contr. U. S. Nat. Herb. 23:659. 1923.—*Tapirira edulis* Brandg., Zoe 5:78. 1900.—*Type locality*: San José del Cabo, Lower California.

A heavy-limbed, spreading tree which is most common on sandy or gravelly plains, but which is not infrequent on rocky hillsides. It was observed at San Josef Island (3938, 3939), San Evaristo Bay, Espiritu Santo Island, La Paz (4016), and Ceralbo Island (4034). The framework of the tree suggests that of a *Bursera* or a *Veatchia*. It has a smooth yellowish papery bark. The common height of the tree is 12-25 dm., and the usual breadth is twice that much. Large trees, like those seen on San Josef Island, become 3-6 m. high. The flowers are polygamo-dioecious and usually appear before the leaves. At La Paz and San Evaristo the tree was called "ciruela."

206. *Veatchia discolor* (Benth.) Brandg.

Veatchia discolor Brandg., Proc. Calif. Acad. Sci. II, 2:140. 1889.—*Schinus discolor* Benth., Bot. Sulph. 11, t. 9. 1844.—*Pachycormus discolor* Cov. in Goldman, Contr. U. S. Nat. Herb. 16:344. 1916.—*Type locality*: Magdalena Bay, Lower California.

A small colony of this species was found in the Sierra Giganta back of Escondido Bay (4129) where it was growing on a rocky cañon side at about 540 m. altitude. The trees were similar in form and habit to those found further north, but had milky instead of brownish juice. The collection agrees in size, pubescence of flower, and in size of leaf with those found about Magdalena Bay, but differs in having a more ample inflorescence.

In the past only a single form of *Veatchia* has been recognized, but it is quite evident that there are three geographical variants included in the old *V. discolor*. One of the important characters of the restricted *V. discolor* is its comparatively large leaves. In typical *discolor* well developed leaves, which Bentham's type apparently does not show, are 6-8 cm. long and 25-35 mm. wide, or in other words a third larger than in any other *Veatchia* variant. The corolla is a little larger than in the variety *pubescens* and conspicuously smaller than the reddish pubescent corolla of the variety *veatchiana*. The restricted *discolor* is known only from Santa Margarita and Magdalena islands on the west coast, and from slopes of the Sierra Giganta near the east coast of the peninsula. The range is therefore south of N. lat. 26°. Brandegee's description (loc. cit.) only partly concerns the delimited *discolor*, the larger part, especially the floral structure, being based on specimens of var. *pubescens*. The name *Pachycormus discolor* was first published in the Century Dictionary (rev. ed. 10:6708. 1911), but as no authority is given there for the new generic name or for the combination that publication can hardly be accepted.

207. *Veatchia discolor* var. *pubescens* (Wats.), n. comb.

Bursera pubescens Wats., Proc. Am. Acad. 24:44. 1889.—*Type locality*: Los Angeles Bay, Lower California.

Seen only on Angel de la Guarda Island (3362, 3366, 3400) and at Los Angeles Bay (3432). This tree was one of the most striking of the floral features on the northern part of Angel de la Guarda Island, forming groves on the north-facing slopes where the white-barked individual trees—leafless during our visit—were sharply contrasted against the brown volcanic rocks and conspicuous for some distance off shore. At Los Angeles Bay it was frequent on the gravelly plain facing the bay, and somewhat less common on the slopes of the near-by mountains.

The plant is dioecious and is deciduous. It is leafless, though frequently flowering, during the dry seasons. The tree is weird and interesting. Its trunk is stout and the limbs very heavy for their length, commonly crooked, and widely spreading. Nelson (Nat. Geogr. Mag. 22:463. 1911) has applied to the tree the adjective "drosical" which most aptly conveys the impression of weird massiveness so characteristic of the plant. The wood is very brash, limbs a full decimeter thick being easily broken. Upon the death of the tree the wood quickly softens and decays within the more persistent bark, and the whole tree, with all its limbs attached, sinks to the ground and flattens out as if deflated. According to Rose (Contr. U. S. Nat. Herb. 1:318. 1895) the bark is used for tanning, but certainly the wood is too soft and ephemeral for much use. A hard stick may be thrust into a limb for a depth of 15 mm. All the old wood is covered with a tight, white, smooth, papery bark that annually peels off in large parchment-like pieces. Injury to the tree results in the flow of a reddish-brown sap which, when coming from a smooth, plump, white-skinned branch, makes the whole startlingly like a bleeding human limb. The average height of the tree is between 3 and 5 m., with the average breadth slightly less. The largest tree seen (source of number 3366) was 7 m. high and 9 m. broad; the trunk was 6 dm. in diameter near its top about 3 dm. above the ground.

Veatchia discolor var. *pubescens* was first described by Watson who mistook sterile specimens for an undescribed *Bursera*. It is the most widely distributed of the varieties of *V. discolor* and is probably the best known. It ranges over the north middle segment of the peninsula between N. lat. 27°

and 30°, and is characterized by its very loose deltoid inflorescence of small flowers, by its rather small leaves, and perhaps also by its brownish sap. The plates and most of the notes given by Goldman (Contr. U. S. Nat. Herb. 16:344, t. 118. 1916) refer to the variety *pubescens*.

208. *Veatchia discolor* var. *veatchiana* (Kell.), n. comb.

Rhus veatchiana Kell., Proc. Calif. Acad. Sci. 2:24. 1860.—*Veatchia cedrosensis* Gray, Bull. Calif. Acad. Sci. 1:4. 1884.—*Type locality*: Cedros Island, off west coast of Lower California.

This variety is definitely known only from Cedros Island, but the *Veatchia* that Brandegee (Zoe 5:24. 1900) reports from Natividad Island may be the same. Veatch gave an interesting account of the plant in the *Hesperian* (p. 50) for April, 1860 (Brandegee, Proc. Calif. Acad. Sci. II, 2:141. 1889 makes the article more accessible by copying it nearly verbatim); and Greene (Pittonia 1:198. 1888) gives more interesting details in his account of Cedros Island. The Cedros Island plant has large flowers (6 mm. long) which surpass the largest flowers on peninsular material by nearly 2 mm. The flowers are also very much coarser, more colored, and conspicuously more pubescent than in the other forms of *Veatchia discolor*. The inflorescence seems to be quite dense and oblong in outline, while the leaves are very small, the largest being only 15 mm. wide and 5 cm. long. Comments by Greene and Veatch indicate that the juice is milky and that perhaps the bark is more darkly colored than in *pubescens*, but a piece of wood on a sheet (Rose 16105) in the National Herbarium has contrary indications. Although exact dates can not be given, it seems quite certain that the publication of *Rhus veatchiana* in the Proceedings of the California Academy of Sciences antedates by several months the publication in the *Hesperian*. It should be noted in this variety, as in the other forms of the species, that the petals are erect and not spreading as shown in Kellogg's plate in the *Hesperian* (duplicated in Bull. Calif. Acad. Sci. 1: t. 10. 1885) or in Bentham's plate in the Botany of the Voyage of the Sulphur (t. 9. 1844).

XLVIII. CELASTRACEÆ

209. *Maytenus phyllanthoides* Benth.

Maytenus phyllanthoides Benth., Bot. Sulph. 54. 1844.—
Type locality: Magdalena Bay, Lower California.

A very common and characteristic shrub of alkaline or subalkaline soils. It usually grows about saltflats or on beaches a short distance above high tide. Along the Sonoran coast it was observed at the south end of Tiburon Island (4279), Kino Point, San Pedro Bay, and San Carlos Bay. On the peninsular side of the gulf it occurred at every one of the stations, excepting only Santa Inez and Ildefonso islands, south of Tortuga Island (3049, 3656, 4139). On Tortuga Island it formed a small colony on a barren lava slope a short distance below the west crater-rim. The plant is a thick-leaved, very dense shrub which is usually about 2 m. high but which sometimes attains 3 m. in height. The bark is rather smooth, dark, and conspicuously glaucous. The flowers are inconspicuous and greenish, but when the numerous greenish-red capsules are mature the exposed red aril makes the plant very striking. It was called "mangle" at La Paz.

XLIX. SAPINDACEÆ

210. *Cardiospermum corindum* L.

Cardiospermum corindum L., Sp. Pl. ed. 2, 526. 1762.—
Cardiospermum palmeri Vasey & Rose, Proc. U. S. Nat. Mus. 13:147. 1890.—*Type locality*: Brazil.

This is a frequent vine which trails over shrubbery growing in washes. Collections were made at Guaymas (3108), Tiburon Island (3248, 4262), San Francisquito Bay (3558), Carmen Island (3824), Escondido Bay (4138), and Ceralbo Island (4063). With the exception of the Guaymas and the first cited Tiburon collection which are merely puberulent, and the Ceralbo collection which has pubescent fruit, the collections represent typical *C. palmeri*. Radlkofer (Martius, Fl. Brasil. 13:447. 1897) refers *palmeri* to *C. corindum* forma *loxense*. The peninsular plants are very variable as Brandegee (Proc. Calif. Acad. Sci. II, 3:122. 1891) has pointed out.

211. *Cardiospermum halicacabum* L.

Cardiospermum halicacabum L., Sp. Pl. 366. 1753.—*Type locality*: Jamaica.

An herbaceous vine growing in gravelly soil and climbing over shrubs. It was collected at San Nicolas Bay (3703) and Guadalupe Point (4159). Referred to the species also is a collection from Magdalena Bay by Lung, and a Brandege collection from San Gregorio. The four collections mentioned are glabrous or practically so. Radlkofer (Martius, Fl. Brasil. 13:432. 1897) keys *C. halicacabum* from *C. corindum* by giving the former as herbaceous and with seeds which have a large cordate-bilobed hilum, and the latter as being shrubby and with seeds which have a small suborbicular or emarginate hilum. The habit and seed characters do not vary together, and furthermore fail to show a decided tendency to be extreme and positive. It would seem that *corindum* is only a pubescent phase of *halicacabum*.

212. *Dodonaea viscosa* (L.) Jacq.

Dodonaea viscosa Jacq., Enum. Pl. Carib. 19. 1760.—*Ptelea viscosa* L., Sp. Pl. 118. 1753.—*Type locality*: West Indies.

Collected at San Pedro Bay (4319) where a single plant was found in a cañon, and at Escondido Bay (3849) where it is frequent on a diluvial plain at the foot of the Sierra Giganta. It is a resinous glutinous shrub 15-20 dm. high, with rather close erect branches. The Escondido Bay collection, apparently like all other peninsular material, represents the broad-leaved variety *spathulata* Benth., whereas the San Pedro Bay collections agree with the Arizonian and Sonoran material in being the narrow-leaved variety *angustifolia* Benth.

213. *Paullinia spinosa* (Radlk.), n. comb.

Cardiospermum spinosum Radlk., Contr. U. S. Nat. Herb. 1:368. 1895.—*Type locality*: La Paz, Lower California.

A low, rounded, compact, spinescent shrub 6-9 dm. high, which is rather common on the rocky hillsides near the ocean at La Paz (3047). This plant was doubtfully referred to *P.*

tortuosa by Vasey and Rose (Contr. U. S. Nat. Herb. 1:68. 1890). Brandegee (Proc. Calif. Acad. Sci. II, 3:123. 1891) recognized its true generic relations, but ventured no specific determinations. The shrub is undoubtedly a *Paullinia* and nearest to, but quite distinct from, *tortuosa*, from which it differs conspicuously in its stouter, more thorny stems and larger ternate leaves.

There is another bushy *Paullinia* in Lower California. It was first collected by Xantus and was indicated as "*Cardiospermum* ? sp. nov." by Gray (Proc. Am. Acad. 5:155. 1861). Watson (Bibl. Index 79. 1878) referred the plant to "*Cardiospermum tortuosum*," but Radlkofer (Sitzungbr. Bayer. Akad. München 8:222. 1878) considered it a *Serjania* and described it as *S. californica*. In 1890 the plant was collected at San José del Cabo by Brandegee who, like Xantus, found it only in flower. A study of the Brandegee and the Xantus collections seems to show that the plant is definitely a *Paullinia*, for the habit, foliage, and range all indicate a close relative of *P. tortuosa* and *P. spinosa*, whereas its association under *Serjania* is based only on the resemblance of some scraps of the Xantus collection to a species of *Serjania* which is geographically much removed. It is proposed, therefore, that the plant be called *Paullinia californica*, n. comb. The nearest relative of *P. californica* is *P. spinosa*, from which it differs in its 5 leaflets and much looser and less stiff habit. From *P. tortuosa* it differs notably in its less deeply cut glabrate leaves.

214. *Paullinia tortuosa* (Benth.) Brandg.

Paullinia tortuosa Brandg., Zoe 2:74. 1891.—*Cardiospermum tortuosum* Benth., Bot. Sulph. 8, t. 6. 1844.—*Type locality*: Magdalena Bay, Lower California.

Typical representatives of this species were found in a gravelly wash on Ceralbo Island (4031) where it formed an open bush 6-9 dm. high. The only previous collections are from San José del Cabo and from Magdalena Island. The sterile bushy and uncollected *Paullinia* observed in the rocky draws on Espiritu Santo Island is probably this species, but may be *P. spinosa*.

215. *Sapindus saponaria* L.

Sapindus saponaria L., Sp. Pl. 367. 1753.—*Type locality*: Brazil.

Locally frequent on a gravelly cañon floor at the head of San Carlos Bay (4346). It is a tree 3-6 m. high with rather stout trunk and strictly ascending branches. The vigorous shoots have simple lanceolate leaves, and not pinnate ones as have the older branches. Although the plant is usually described as evergreen, the plants seen were certainly deciduous, for only a few stray branches had adhering leaves at the time of collecting.

L. RHAMNACEÆ

216. *Colubrina californica*, n. sp.

A rather dense shrub about 2 m. high with intricate and rigidly divaricate terete gray-tomentose branches; leaves fascicled, oblong-obovate to obovate, 10-17 mm. long, 8-11 mm. wide, margin entire, base rounded or broadly cuneate, tip obtuse to broadly mucronate, veining pinnate, dull in color due to a short appressed pubescence which is most abundant on veins and midrib; petioles 1-1.5 mm. long, densely pubescent; flowers in dense axillary clusters crowded on the younger twigs to form a close narrow leafy thyrse 2-5 cm. long and about 1 cm. wide; pedicels less than 1.5 mm. long and densely tomentose in flower, in fruit becoming stouter and about 2 mm. long; calyx tomentose without, lobes broadly deltoid, widely spreading and tardily deciduous; tube adherent to ovary and filled by the broad disk; expanded calyx about 4.5 mm. wide; petals clawed, yellowish, 1 mm. long, a little exceeding the stamens; anthers shielded by cucullate blade of petal; capsule strongly depressed, obovate, 6 mm. high, 1 cm. broad shallowly grooved; seeds brown, 6 mm. long, smooth.

Type: No. 1290, Herb. Calif. Acad. Sci., collected May 8, 1921, by I. M. Johnston (no. 3496) on a gravelly cañon floor at **Las Animas Bay, Lower California.**

This is an infrequent shrub on the gravelly floor of a large cañon in the hills just south of Las Animas Bay (3496) where only a single plant was seen in flower. It is otherwise

known only from a specimen in the National Herbarium (*Nelson & Goldman 7197*) from "Aguajé de San Esteban, 25 miles N. of San Ignacio." The plant forms a dense intricately branched shrub with stiff, almost spinose branches, and is dull in color, globose in shape, and 15-25 dm. high. Its relationships appear to be with *C. texana* Gray, and with *C. glabra* Wats., but it differs from both in its inflorescence, short pedicels, persistent style, and more compact habit of growth. From *C. texana*, which ranges east of the continental divide, it differs in its smaller, entire-margined, less venose, not 3-nerved leaves; and from *C. glabra*, which grows in the same region, it differs in its pubescence, its rigid habit, and in its very much larger fruit. The white tomentum which clothes the stems of *C. californica* at once distinguishes it from all of the other known Colubrinias of the gulf area.

217. *Colubrina glabra* Wats.

Colubrina glabra Wats., Proc. Am. Acad. 24:44. 1889.—

Type locality: Ravines about Guaymas, Sonora.

A common, but unobtrusive, shrub in the gulf area which was rarely collected due to its sterile and almost leafless condition during the summer months. It was collected at San Pedro Nolasco Island (3136), Tiburon Island (3273), San Esteban Island (3197), San Francisquito Bay (3583), and Ceralbo Island (4045). It was recognized on the following islands: Angel de la Guarda, Tortuga, San Marcos, Carmen, Catalina, Santa Cruz, San Josef, and Espiritu Santo and at the following bays: San Pedro, Las Animas, San Nicolas, Coyote, Escondido, and Agua Verde. The plant frequents cañons, grows in gravelly or rocky soil, and usually forms an open bush about 25 dm. high. The Ceralbo plant was a very compact, twiggy globose mass about a meter high, probably due to the cattle which were ubiquitous in the particular locality.

218. *Condalia globosa*, n. sp.

Shrub 12-24 dm. high, with intricate and very sharply pungent branches; younger branches reddish, pruinose; older branches grayish or brownish; leaves narrowly spatulate,

fasciculate, broadly acute to emarginate, entire, short petio-
late, glabrous, 7-14 mm. long, 2-3 mm. wide, with a few
broad prominent veins below; pedicels solitary or geminate,
slender, 4-7 mm. long; sepals deciduous, flowers otherwise as in
C. spathulata; fruit more or less spherical, black, juicy, 4-5.5
mm. broad.

Type: No. 1291, Herb. Calif. Acad. Sci., collected April 11,
1921, by I. M. Johnston (no. 3028) on a gravelly beach at **La
Paz, Lower California.**

The typical glabrous form of this new species was taken
only at La Paz (3028), San Josef Island (3941), and Guay-
mas (3106), but the plants observed at San Evaristo Bay and
on Ceralbo Island are probably the same. Brandegee has col-
lections from San Luis, San Sebastian, Purisima, and Monte-
cito; and Purpus has taken it at Arroyo Calmalli (77) and
San José del Cabo (468). The plant is infrequent and forms
intricate very spinescent upright shrubs about 15 dm. high.
It grows in sandy or gravelly soil. The shrub is extremely
prolific and is usually covered with myriads of black juicy
fruits. The rigid spines make the collecting of the plant a
very disagreeable, not to say painful, task. It is very closely
allied to *C. spathulata*, with which the peninsular material has
been confused, but differs in its black juicy globose fruit, longer
pedicels, deciduous sepals, and glabrous usually larger leaves.

219. *Condalia globosa* var. *pubescens*, n. var.

Leaves as in the species but densely short pubescent.

Type: No. 1292, Herb. Calif. Acad. Sci., collected April 19,
1921, by I. M. Johnston (no. 3201) in a sandy wash on **San
Esteban Island, Gulf of California.**

This variety is only the northern pubescent phase of the
species, and seems to grow in the territory which is geo-
graphically intermediate between that occupied by *C. globosa*
and *C. spathulata*. Collections of the variety were made at
San Esteban Island (3201, 4404), San Francisquito Bay
(3585), and Tepoca Bay.

There is a very different species of *Condalia* which Brande-
gee collected at San Pablo and at San Julio Cañon, and which
Trelease (Syn. Fl. N. Am. 1:403. 1897) referred to as an

atypical form of *C. mexicana*. The plant in question is very distinct from *mexicana*, which has smaller fasciculate pubescent leaves, a more compact habit, and smaller fruit. The peninsular plant may therefore be called **Condalia brandegei**, n. sp. Its relations seem to be definitely with *C. obovata*, but it differs in having larger oblong long-pedicellate fruit, fewer firmer leaves, and a widely separated range. *C. brandegei* also suggests *C. parryi*, but differs in the texture of its leaves, and in the smaller short-pedicellate more juicy fruit.

220. **Condalia lycioides** var. **canescens** (Gray) Trel.

Condalia lycioides var. *canescens* Trel. in Gray, Syn. Fl. N. Am. 1:403. 1897.—*Zizyphus lycioides* var. *canescens* Gray in Rothrock, Rep. U. S. Geol. Surv. w. 100th Merid. 6:82. 1878.—*Condalia divaricata* Nels., Bot. Gaz. 47:427. 1909.—*Type locality*: Gila River Valley, Arizona.

This homely, spinescent shrub was collected at La Paz (3025), San Esteban Island (3202), Tiburon Island (3256, 4272), and Tepoca Bay (3305). It grows on dry rocky benches or along gravelly cañons, forming a loosely, intricate upright shrub 10-18 dm. high. At La Paz it was called "fachada" by a small boy.

221. **Gouania mexicana** Rose

Gouania mexicana Rose, Contr. U. S. Nat. Herb. 3:314. 1895.—*Type locality*: Culiacan, Sinaloa.

Locally frequent and loosely scandent over large shrubs in a cañon at the head of San Carlos Bay (4375).

222. **Karwinskia humboldtiana** (R. & S.) Zucc.

Karwinskia humboldtiana Zucc., Abh. Akad. München 1:353. 1832.—*Rhamnus humboldtiana* R. & S., Syst. 5:295. 1819.—*Karwinskia pubescens* Standley, Contr. U. S. Nat. Herb. 23:716. 1923.—*Type locality*: Mexico.

Collected on Espiritu Santo (3961) and Ceralbo (4068) islands, and at Agua Verde (3889) and Escondido (4109) bays. It is usually a loose erect-growing shrub or small tree

20-25 dm. high, which grows in gravelly ground along cañons, but on Espiritu Santo Island it occurred also on the exposed mesa-like ridges and formed compact, unkempt, twiggy masses 10-15 dm. high. The bark is furrowed.

223. *Zizyphus sonorensis* Wats.

Zizyphus sonorensis Wats., Proc. Am. Acad. 24:44. 1889.
—*Type locality*: Guaymas, Sonora.

Common about the margins of salt marshes at Guaymas (3116) and San Carlos Bay, forming small scattered thickets 18-20 dm. high. At San Pedro Bay (4311) a single colony was found growing under the shelter of a cliff in a cañon well back from the ocean.

LI. VITACEÆ

224. *Vitis girdiana* Munson

Vitis girdiana Munson, U. S. Dept. Agr. Div. Pomol. Bull. 3:10. 1890.—*Type locality*: Southern California.

The grape doubtfully referred to this species grew in great profusion over the trees and rocks in the large cañon in the Sierra Giganta back of Escondido Bay (4121). It grew on the cañon floor along a small stream which ran down to about 350 m. altitude. Brandegee's collections from the cape region appear to represent a form with smaller, less dentate and more pubescent leaves, but his Comondú collection, while more pubescent, has leaves of similar size and shape. The collection is in full fruit, whereas Brandegee's are in flower only.

LII. MALVACEÆ

225. *Abutilon lemmoni* Wats.

Abutilon lemmoni Wats., Proc. Am. Acad. 20:357. 1885.
—*Type locality*: Santa Catalina Mountains, Arizona.

Doubtfully referred here are plants from San Francisquito Bay (3584) and from Freshwater Bay on Tiburon Island (3272).

226. *Abutilon nuttallii* T. & G.

Abutilon nuttallii T. & G., Fl. N. Am. 1:231. 1838.—*Type locality*: On the Red River.

A few plants apparently of this species were observed on Tortuga Island (4189). They formed rounded, rather dense growths 5-12 dm. high and grew on a dry lava slope.

227. *Abutilon palmeri* Gray

Abutilon palmeri Gray, Proc. Am. Acad. 7:289. 1870.—*Abutilon aurantiacum* Wats., Proc. Am. Acad. 20:357. 1885.—*Abutilon macdougalii* Rose & Standley, Contr. U. S. Nat. Herb. 16:13, t. 4. 1912.—*Type locality*: Yaqui River, Sonora.

One of the common plants in rocky ground over the higher parts of San Pedro Martir Island (3158) where it grows as a loosely branched perennial, 7-12 dm. high. It is also frequent in washes at Puerto Ballandra on Carmen Island (3831) where it becomes 9-15 dm. high. The flowers are orange. *Abutilon palmeri* seems identical with *A. macdougalii*. The seed and inflorescence developments which characterize *A. aurantiacum*, seem to be influenced by age and are therefore valueless.

228. *Gossypium barbadense* L.

Gossypium barbadense L., Sp. Pl. 693. 1753.—*Type locality*: Barbados.

A common cultivated tree in the patios at Mulegé (3699) and to some extent naturalized in the meadows along the river. It is a large very floriferous shrub or small tree 25-45 dm. high. Upon opening, the petals are creamy yellow with a maroon spot near the base, but after anthesis they become rose-colored.

229. *Gossypium davidsonii* Kell.

Gossypium davidsonii Kell., Proc. Calif. Acad. Sci. 5:82. 1873.—*Type locality*: San José del Cabo, Lower California.

Collected only at San Pedro Bay (4321) where it is frequent on the gravelly plain fronting the ocean. The pubescent

cotton plants observed on Ceralbo Island are no doubt the same. Watt (Cotton Pl. World 66. 1907) suggests that the Sonoran plant is distinct from the one on the peninsula, as his specimen of *Palmer 244* has smaller bracts and frequently toothed leaves. The specimen of *Palmer 244* in the Herbarium of University of California actually has larger bracts than has any of the five collections from San José del Cabo, the type locality of the species, and is entire margined, whereas two of the San José del Cabo collections show inclinations toward a coarsely three-toothed condition. According to Goldman (Contr. U. S. Nat. Herb. 16:348. 1916) the species is common at low elevations in the cape region, and from there it extends, according to Brandegee (Proc. Calif. Acad. Sci. II, 2:136. 1889), northward along the Pacific shore to San Gregorio. Watson (Bot. Calif. 1:82. 1876) reports the species from Cedros Island, but the record is to be doubted for there is no Cedros Island material in the Gray Herbarium and none of the later collectors on Cedros Island has found it. There is in the Gray Herbarium a collection of *G. harknessii* from Carmen Island which, through miscitation, probably is the basis for the Cedros Island record. San Pedro Bay and Guaymas are the only known stations for the species in Sonora.

230. *Gossypium harknessii* Brandg.

Gossypium harknessii Brandg., Proc. Calif. Acad. Sci. II, 2:136. 1889.—*Type locality*: Santa Margarita Island.

Cotton of this species was seen on San Marcos (3645), Coronados, Carmen (3805, 4144), and Monserrate islands; and at San Nicolas Bay, Loreto (3789), and Escondido Bay. It forms a flat-topped, loosely intricate shrub about 9 dm. high and 10-15 dm. broad. Common on rocky benches and particularly on gravelly washes. The bush has a clean glabrous and frequently glaucous foliage, and an abundance of bright yellow flowers. It is a very ornamental shrub and is much more handsome than *G. davidsonii*. The corolla is lemon-yellow with a maroon spot above the claw on each petal and with the outer petals more or less maroon flushed. Old withered flowers are rose-colored. Bruised flowers become

greenish when dried. On Carmen and San Marcos islands the plant is called "algodon cimarron". Away from the gulf shore of the peninsula the plant is known only from about the type locality on Santa Margarita Island.

Gossypium sp.

Specimens of an undetermined cotton were collected from a few bushes growing on a sandy clearing at La Paz (3065). The plants were shrubby with strict tufted stems 12-24 dm. high, and were pointed out by a small boy as "algodon". The petals are cream-colored and non-spreading. The striking features of the plant are its 1- to 3-lobed leaves, very large (4-6 cm. long) deeply lacerate bracts, and large corollas (petals 35-50 mm. long). It resembles certain Mexican species; e.g., *G. palmeri* Watt, *G. fruticosum* Tod., *G. schottii* Tod., and *G. lanceolatum* Tod. These species are given by Watt (Cotton Pl. World 164. 1907) as having free bracts whereas the La Paz collection has definitely united bracts. It should be noted, however, that the type collection of *G. palmeri* has the bracts somewhat united.

231. *Hibiscus denudatus* Benth.

Hibiscus denudatus Benth., Bot. Sulph. 7, t. 3. 1844.—
Type locality: Magdalena Bay, Lower California.

Common and widely distributed over the peninsula. Collections were made on Tiburon (4261), San Esteban (3173), and Angel de la Guarda (3416) islands, and at Tepoca Bay (3280). The plant was recognized at San Luis Gonzales, Los Angeles Bay, Las Animas, San Nicolas, and Agua Verde bays, and on Tortuga, San Marcos, Coronados, and Carmen islands. It is characteristic of gravelly washes and rocky hill-sides, and forms tufted growths 3-6 dm. high. The petals are white or pinkish with a red or purplish claw.

232. *Horsfordia alata* (Wats.) Gray

Horsfordia alata Gray, Proc. Am. Acad. 22:297. 1886.—
Sida alata Wats., Proc. Am. Acad. 20:356. 1885.—*Horsfordia palmeri* Wats., Proc. Am. Acad. 24:40. 1889.—*Type locality*: Northwestern Sonora.

Collected at Freshwater Bay on Tiburon Island (3253) and at Los Angeles Bay (3480). At the former locality the plant grew 25 dm. high and formed a small colony along the edge of a sandy draw. At the latter station it grew only 9 dm. high and was rare, only a few plants being observed at the foot of a rocky slope. The plant is strictly and sparingly branched, and has pink flowers (which dry bluish) 2 cm. broad. Other collections have been examined from Sierra de la Trinidad, La Paz, and San Gregorio. The specimen reported by Brandegee (Proc. Calif. Acad. Sci. II, 2:135. 1889) from Llano de Santana, appears to be *H. newberryi*. *Horsfordia alata* is nearest to *H. newberryi* but differs in its large pink, instead of small orange, flowers, less conspicuously winged carpels, looser, more branching habit, broader, more cordate leaves, and looser, less abundant dull sordid, instead of bright yellowish, tomentum. *Horsfordia rotundifolia* Wats. (Proc. Am. Acad. 24:40. 1889), the other species of the genus, is at once recognized by its fine close pubescence, low slender stems, cordate leaves, and naked inflorescence. It has a synonym in *H. purissima* Brandg. (loc. cit.).

233. *Horsfordia newberryi* (Wats.) Gray

Horsfordia newberryi Gray, Proc. Am. Acad. 22:297. 1886.—*Abutilon newberryi* Wats., Proc. Am. Acad. 11:25. 1876.—*Type locality*: Canebrake Cañon on the lower Colorado River, Arizona.

Taken on San Esteban (3177) and Angel de la Guarda (3392) islands, and at Los Angeles (3486) and San Francisco (3557) bays. A strictly erect perennial 6-15 dm. high, either simple or compactly branched above. The flowers are orange and small, being about 1 cm. broad. It is characteristically a plant of gravelly washes and was nowhere observed to be common.

234. *Sida spinosa* var. *angustifolia* (Lam.) Griseb.

Sida spinosa var. *angustifolia* Griseb., Fl. Brit. W. Indies 74. 1859.—*Sida angustifolia* Lam., Dict. 1:4. 1789.—*Type locality*: "Indies".

A single plant of this variety was found growing in a wet meadow that bordered on a Typha thicket at Mulegé (3691).

235. *Sphæralcea ambigua* Gray

Sphæralcea ambigua Gray, Proc. Am. Acad. 22:292. 1887.—*Type locality*: Grand Cañon, Arizona.

Collected at Las Animas (3506) and San Francisquito (3556) bays, and on San Pedro Martir (3145), San Esteban (3172) and Angel de la Guarda (3415, 4214) islands. The species seems to occur only on the northern third of the peninsula and on the adjacent islands. It is most frequent in gravelly washes, but on San Pedro Martir Island it occurs in great abundance on rocky ground in the cactus forest which crowns the island. The plant is perennial, with a shrubby caudex and virgate branches 3-12 dm. high. The flowers are orange. The reference to *S. ambigua* is unsatisfactory although precedent sanctions the present use of the name. Due to the great confusion in the genus, a satisfactory determination can not be made short of a generic revision. Suffice to say, that the peninsular plant is the same as that common in the deserts of California. Typical *S. ambigua*, judging from material collected in the Grand Cañon and adjacent area, seems to be the flat-leaved, lightly-tomentose plant which, in the Southwest, has been largely referred to *S. munroana*.

236. *Sphæralcea coulteri* (Wats.) Gray

Sphæralcea coulteri Gray, Proc. Am. Acad. 22:291. 1887.—*Malvastrum coulteri* Wats., Proc. Am. Acad. 11:125. 1875.—*Malveopsis coulteri* Kuntze, Rev. Gen. 1:72. 1891.—*Sphæralcea californica* Rose, Contr. U. S. Nat. Herb. 1:66. 1890.—*Malvastrum multiflorum* Greene, Fl. Francis. 108. 1891.—*Sphæralcea margaritæ* Brandg., Zoe 5:156. 1903.—*Type locality*: "Southern California," but probably from Arizona or Sonora.

Forming a large colony in a sandy clearing at La Paz (3067), and frequent along the silty river bottoms at Mulegé (3667). The plants are annual or biennial, and may persist even longer; they are branched at the base with many ascending wand-like branches which reach a meter in length. The flowers are a bright orange. Called "chuale" by a small boy at La Paz. The types of all the proposed segregates of this species have been examined and found to be indistinguishable.

237. *Sphæralcea hainesii* Brandg.

Sphæralcea hainesii Brandg., Proc. Calif. Acad. Sci. II, 2:136. 1889.—*Type locality*: Jesus Maria, Lower California.

A single plant found in a willow thicket at Mulegé (3675) is referred to this species. It has orange flowers and grew 18 dm. high. The leaves are a full decimeter long. The collected specimens are atypical in their insufficiently developed bractlets and sparsely pubescent calyx. The species seems to grow in that section of the peninsula lying between 25° and 27° N. lat. In the region it is recognized by its non-crisped, flat, oblong, rather large leaves.

238. *Sphæralcea macdougalii* Rose & Standley

Sphæralcea macdougalii Rose & Standley, Contr. U. S. Nat. Herb. 16:13, t. 5. 1912.—*Type locality*: Papago Tank in Pinacate Mountains, Sonora.

Collected at Tepoca Bay (3296) where it grew on a stony slope and became 2-4 dm. high with strictly ascending stems from a shrubby caudex. In flowers and inflorescence the collected plant resembles the type, but it differs in having considerably smaller curled leaves. The species probably ranges over northwestern Sonora and can be recognized by its few large flowers.

239. *Sphæralcea axillaris* Wats.

Sphæralcea axillaris Wats., Proc. Am. Acad. 24:41. 1889.—*Sphæralcea violacea* Rose, Contr. U. S. Nat. Herb. 1:81. 1890.—*Type locality*: Mulegé, Lower California.

Frequent along the silty bottoms at Mulegé (3669) and on the talus footing gypsum cliffs on San Marcos Island (3616). The plant has an erect axis 10-25 dm. high. with many ascending laterals. It is very weak and commonly the axis and laterals tend to droop. The petals are pink. The plant was called "malva rosa" on San Marcos Island. This pink-flowered plant is common about San José del Cabo and is the one reported by Gray (Proc. Am. Acad. 5:154. 1861) as *S. incana*. The type of *S. axillaris* is in advanced maturity and is

peculiar in having the flowers in close node-like clusters. It seems evident that it is a peculiar variation of the widely distributed plant here referred to it.

LIII. STERCULIACEÆ

240. *Ayenia pusilla* L.

Ayenia pusilla L., Syst. Nat. ed. 10, 1247. 1759.—*Type locality*: Caribbean Region.

Common in a sandy wash on San Esteban Island (3184) where it forms suffrutescent mats 3-6 dm. broad. This is a narrow-leaved form, similar to that growing in Arizona and California and which seems never to have been named.

241. *Melochia tomentosa* L.

Melochia tomentosa L., Syst. Nat. ed. 10, 1140. 1759.—*Moluchia tomentosa* Britt., Mem. Brooklyn Bot. Gard. 1:69. 1918.—*Type locality*: Jamaica.

Widely distributed but not common in the gulf area. Growing on Tortuga, Carmen, San Pedro Nolasco, Espiritu Santo (4077, 3962), and Ceralbo (4033) islands; and at Guaymas (3093), at Guadalupe Point (4160), and at San Carlos (4400), San Pedro (4299), San Francisquito (3568), San Nicolas (3734), Escondido (3853), and Agua Verde (3909) bays. San Francisquito Bay appears to be the northern-most station on the Pacific Coast. The plant is a loose, erect, little-branched shrub 15-25 dm. high, growing scattered in gravelly washes or less commonly on rocky hillsides. The flowers are magenta and appear to be present throughout the year. The peninsular material has larger, thicker, and more densely tomentose leaves, stouter branches, and a closer, more floriferous inflorescence than the material from Sonora. The Sonoran plants seem to be referable to *M. speciosa* Wats. (Proc. Am. Acad. 24:42. 1889), the type of which came from Guaymas. The type of *M. arida* Rose (Contr. U. S. Nat. Herb. 8:321. 1905), a critical species, also came from Guaymas.

242. *Waltheria americana* L.

Waltheria americana L. Sp. Pl. 673. 1753.—*Type locality*: Bahama Islands.

Found in a gravelly wash in a cañon back of San Carlos Bay (4401). A prostrate shrubby plant with stems 1-4.5 dm. long.

LIV. VIOLACEÆ

243. *Hybanthus fruticosus* var. *flavescens* (Dowell), n. comb.

Calceolaria fruticulosa var. *flavescens* Dowell, Bull. Torr. Cl. 35:551. 1906.—*Type locality*: Guaymas, Sonora.

Locally common in gravelly washes at San Pedro (4297) and San Carlos (4366) bays. The plants are densely tufted, 15-20 cm. high, have many persistent dead stems, and are slightly suffrutescent below. The Sonoran material differs from *Hybanthus fruticosus*, n. comb. (*Ionidium fruticosum* Benth.), the peninsular plant, in having yellowish-green glabrous foliage.

LV. FRANKENIACEÆ

244. *Frankenia grandifolia* C. & S.

Frankenia grandifolia C. & S., Linnæa 1:35. 1826.—*Type locality*: San Francisco Bay, California.

Sterile plants of what is believed to represent this species are common in the salt marsh at Tepoca Bay.

245. *Frankenia palmeri* Wats.

Frankenia palmeri Wats., Proc. Am. Acad. 11:124. 1876.—*Type locality*: "Gulf shore of Lower California."

Seen at the north and south ends of Tiburon Island (3263, 4280), Tepoca Bay (3285), San Luis Gonzales Bay (3352), all stations on Angel de la Guarda Island (3396), Los Angeles Bay, and Las Animas Bay. It is one of the most characteristic coastal shrubs in the northern part of the gulf area. The plant grows in saline soil about salt flats and lagoons, on dunes, and on loamy bluffs and plains, but always confined to a belt near

saltwater. It does not seem to demand saline soil, but merely an exposure to salt air. Its surface is covered with salt which renders drying difficult in a moist atmosphere. It forms a compact globose shrub 6-9 or 12 dm. high. Usually well spaced, but frequently it is aggregated to form dense low hedge-like belts many square meters in extent. The corolla is white and the exerted anthers are a pinkish orange in color. The type locality has not been definitely determined. Palmer, who is said to have collected the type, is not known to have been within the range of the species previous to its publication. It may have been collected by Pringle and incorrectly attributed to Palmer.

LVI. FOUQUIERIACEÆ

246. *Fouquieria burragei* Rose

Fouquieria burragei Rose, Jour. N. Y. Bot. Gard. 12:267. 1911.—*Type locality*: Pichilique Island.

Arborescent, 3-4 m. high, with the habit of *F. peninsularis* Nash, having a short trunk 3-6 dm. high and many crooked spreading branches; spines 15-25 mm. long; inflorescence racemose-paniculate, 12-20 cm. long, 2-3 cm. wide, sparsely flowered, the strictly ascending branches usually 5 mm. long but becoming rarely 15 mm. long; sepals oval or orbicular, 4-5 mm. long, old-rose above but nearly white below; corolla 10-12 mm. long, salverform; corolla-tube ca. 8 mm. long, 4 mm. wide, very pale salmon-pink outside; corolla lobes spreading, salmon-pink in bud but lighter upon expansion, 2-4 mm. long, orbicular to triangular-ovate; stamens conspicuously exerted; filaments 8-16 mm. long, flattened, white, glabrous above, included portions coarsely villous, unappendaged; anthers dark yellow, more or less tinged with blood-orange, triangular oblong, base deeply cordate, apex acuminate; style divided half-way or almost to base; capsule about 18 mm. long.

The remarkable *Fouquieria*, which is above briefly described from new material, was collected on the low hills lying just east of La Paz (4015) and again on Ballena Island (4074), an islet off the west coast of Espiritu Santo Island. Previously it has been known only from collections made by Rose at

Pichilique Island and La Paz. In selection of habitat and in habit this species seems almost identical with the quite distantly related *F. peninsularis*. All the known stations for the plant are near La Paz.

247. *Fouquieria peninsularis* Nash

Fouquieria peninsularis Nash, Bull. Torr. Cl. 30:455. 1903.
—*Type locality*: La Paz, Lower California.

In the gulf area this species is one of the most common trees, and to list the places at which it was observed would practically amount to listing all the stations within the area (3050, 3130, 3436, 3546, 3936, 4357). On the peninsula it was seen at every station, but on the mainland only at San Pedro Bay, San Carlos Bay, and Guaymas. It grows on all the gulf islands with the following exceptions,—San Pedro Martir, Tiburon, Patos, Pelican, Georges, San Luis, Sal si Puedes, Ildefonso, and Santa Inez. These insular exceptions are mainly low and alkaline, or whitened bird rocks. The tree seems to grow with equal vigor in sandy washes, on sandy or gravelly plains, or on rocky or scorix-covered hillsides. It is almost universally associated with *Bursera microphylla* and *Jatropha spathulata* to form one of the most characteristic climax associations of the region.

The plant forms a very open irregular tree 15-30 or rarely 60 dm. high, with a clear trunk 2-8 dm. high and 15-25 dm. in diameter. The branches are spreading, crooked, and loosely branched. Not only is the general habit very different from *F. splendens*, but the bark also. In *splendens* the stems increase but little in girth and the epidermal plates (morphologically the decurrent bases of the spines, i.e., petioles) are but little separated, the stems becoming at most merely furrowed. In *peninsularis*, due to the great expansion in girth, the epidermal plates are widely and very irregularly separated, very unequally distributed over the trunk, and utterly lacking in a definite lineate arrangement. In *splendens* the trunk and lower limbs are gray, but in *peninsularis* they are brown, due to the great exposure of the smooth papery bark that underlies the epidermal plates. The exposed bark is papery and resinous, and suggests that of *Bursera*. The flowers of *peninsularis* are quite

different from those of *splendens*. *Fouquieria peninsularis* has dark red or cardinal corollas with erect lobes, the style is shorter, the stamens unappendaged, and the flowers are arranged in a panicle which is triangular or lanceolate in outline. It should be noted that the photograph of *F. peninsularis* given by Goldman (Contr. U. S. Nat. Herb. 16: t. 120. 1916) does not show a typical specimen of the species, the figured plant being too tall, too dense, too regular, and too erect in its branching.

248. *Fouquieria splendens* Engelm.

Fouquieria splendens Engelm. in Wisliz., Mem. No. Mex. 98. 1848.—*Type locality*: Jornada del Muerto, New Mexico.

Collected on Tiburon Island (4258), at Tepoca Bay (3309), and at San Francisquito Bay (3545), and observed at San Luis Gonzales Bay. Goldman's observations (Contr. U. S. Nat. Herb. 16:349. 1916) and the author's, indicate that the species reaches south on the peninsula to about N. lat. 28° 30'. At San Francisquito Bay it is common on the shell-covered mesa back from the beach and grows intermixed with *F. peninsularis*, but at the other localities it grows alone on hillsides or rolling gravelly plains. The growth-habit of this species is very characteristic, being branched at the ground, appearing tufted, and consisting of long usually simple (rarely forked at tip) strict or ascending whip-like stems. The stems are usually gracefully recurved near the end and bear at their tips elongated unilateral racemose clusters of salmon-red flowers. The common height of the plant is 33-45 dm., but it not infrequently attains 6 m. in height.

LVII. KOEBERLINIACEÆ

249. *Koeberlinia spinosa* Zucc.

Koeberlinia spinosa Zucc., Abh. Akad. München 1:359. 1832.—*Type locality*: Mexico.

Seen only at Tepoca Bay (3282) where colonies are frequent along sandy draws. It grows in small groups forming thickets of loosely interlaced, spinescent branches 9-12 dm. high and

2-5 m. broad. The collected material is in fruit only and has more slender branches than have the average specimens from north of the international boundary.

LVIII. PASSIFLORACEÆ

250. *Passiflora arida* (Masters & Rose) Killip

Passiflora arida Killip, Jour. Wash. Acad. Sci. 12:256. 1922.—*Passiflora fatida* var. *arida* Masters & Rose, Contr. U. S. Nat. Herb. 5:182. 1899.—*Type locality*: Guaymas, Sonora.

Collected at San Pedro Bay (4298), San Esteban Island (3200, 4402), San Francisquito Bay (3544), Tortuga Island (3598, 4200), Guadalupe Point (4158), La Paz (3069), and Cerralbo Island (4043). It is a trailing or climbing vine whose stems are lax, remotely branched, and woody only near the base. It is conspicuously different from *P. palmeri*, with which it grew on San Esteban Island and at Guadalupe Point, in its elongated viny herbaceous stems, non-glandular and scarcely oily herbage, and much smaller differently proportioned flowers. The petals are white on both surfaces, but the sepals are greenish below. The corona is a light violet-blue and the staminal tube is marked with purple or magenta oblong dots. It was commonly found in washes, but it also occurs on hillsides. A boy at La Paz wrote its name as "mata de collote."

251. *Passiflora fruticosa* Killip

Passiflora fruticosa Killip, Jour. Wash. Acad. 12:256. 1922.—*Type locality*: Santa Maria Bay, Lower California.

A plant with a very loose upright shrubby caudex 2-4 dm. high, and a few rather short (3-6 dm. long), sprawling stems that show a slight inclination to climb. It was found only on San Francisco (3951) and Espiritu Santo (3978) islands. It is apparently most nearly related to *P. arida* from which it differs in its very oily and somewhat glandular foliage, its shrubby, bushy base, and short non-climbing stems. The plant is a smaller, very much looser, and much less woody plant, and has less glandular herbage and very much smaller flowers, than *P. palmeri*. It was found only on hillsides.

252. *Passiflora gossypiifolia* Ham.

Passiflora gossypiifolia Ham., Prodr. Fl. Ind. Occ. 48. 1825.
—*Passiflora fœtida* var. *gossypiifolia* Masters in Martius, Fl. Brasil. 13:582. 1872.—*Type locality*: West Indies.

Mr. Killip, who determined all the *Passifloræ*, refers here the single plant found climbing through the lower branches of a willow at Mulegé (3660). The same has been collected at Comondú by Brandegee and at Arroyo San Pablo by Purpus. It is a herbaceous vine which, among the peninsular species, is characterized by the brassy color of its foliage.

253. *Passiflora palmeri* Rose

Passiflora palmeri Rose, Contr. U. S. Nat. Herb. 1:131, t. 14. 1892.—*Type locality*: Carmen Island.

Common and frequently even abundant in gravelly washes in the gulf area. Only occasionally found on hillsides. It was seen on Angel de la Guarda (3397, 3406), San Esteban (3167), South San Lorenzo (3536), San Marcos (3640), Coronados (3759), and Carmen (3823) islands; at Mulegé (3659) and Guadalupe Point; and at Las Animas (3500), San Nicolas (3721), Escondido (3848), and Agua Verde (3882) bays. The only previous collections appear to be Palmer's type collection from Carmen Island, and a collection from the head of Concepcion Bay made by Rose. The range of the species is therefore the western islands and western shore of the gulf between lat. 25° 30' and 29° 30' N.

Passiflora palmeri is not a vine, but a shrub with a flattened, loosely intricate, woody framework of branches over which are topped the numerous short (1-3 dm.) leafy stems. The bushes are commonly about 5 dm. high and 8-12 dm. broad. They are entirely self-supporting, the branches making no effort to climb even when the opportunity is offered. The herbage is glandular and very oily, and heavily stains the collecting papers between which it is dried. When in full flower, it is very pretty, being literally covered with hundreds of large white flowers. The petals and sepals are pure white inside, but are, especially the latter, greenish outside. The staminal tube is violet at the base, but white for most of its length.

The corona is light blue to purple, fading upwardly towards the pale tips. The fruit is a sickly yellowish when ripe and at first has a sweetish but not very positive taste that later takes on an unpleasant flavor suggestive of green plums. On San Marcos Island and at Mulegé it is called "sandia de la passion." The species is very constant in its characters and among the peninsular species is characterized by its extremely large (about 7 cm. broad) flowers, and comparatively short (less than 1 mm.) outer crown segments.

LIX. LOASACEÆ

254. *Eucnide cordata* Kell.

Eucnide cordata Kell. in Curran, Bull. Calif. Acad. Sci. 1:137. 1885.—*Mentzelia cordata* Kell., Proc. Calif. Acad. Sci. 2:33. 1860.—*Type locality*: Cedros Island.

A frequent plant in well-drained soil. It is a coarse perennial 3-9 dm. high with a few ascending branches. The lower parts of the branches, and particularly the main stem, become hard and woody. The plant was collected at San Luis Island (3314), Angel de la Guarda Island (3410), Escondido Bay (4133), San Francisco Island (3957), and La Paz (3070).

255. *Mentzelia adhærens* Benth.

Mentzelia adhærens Benth., Bot. Sulph. 15. 1844.—*Type locality*: Magdalena Bay, Lower California.

Collected on San Pedro Martir (3156), Tortuga (3604), and Tiburon (4257) islands; and at Coyote (4171), and San Luis Gonzales (3337) bays. It was seen at several other localities, but always in a condition too advanced for collecting. It is not an uncommon plant in the gulf area. It was found to be most common about Coyote Bay and along the summit of San Pedro Martir Island, at both of which stations it grew in every sheltered place. The plant is usually more or less prostrate, forming loose growths 1-2 dm. high and 5-10 dm. broad. It commonly affects rocky or gravelly situations. The collected plants have small, scarcely lobed leaves, thereby differing from the most of Brandegee's collections.

256. *Mentzelia hirsutissima* var. *stenophylla*
(Urb. & Gilg.) Johnston

Mentzelia hirsutissima var. *stenophylla* Johnston, Univ. Calif. Pub. Bot. 7:443. 1922.—*Mentzelia stenophylla* Urb. & Gilg., Nov. Act. Dents. Akad. 76:80. 1900.—*Type locality*: San Quentin, Lower California.

Referred here is the single plant found growing on a silty flat near the south end of Angel de la Guarda Island (4229). A similar plant was also seen at the north end of the island on a sandy plain at Puerto Refugio. Other collections of this variety have been made at Los Angeles Bay (*Palmer 591*), Calamujuet and Cajon de Santa Maria (*Brandegge*), and San Quentin (*Orcutt 1357*). The characters of the filaments used by Johnston (loc. cit.) to separate the variants of *M. hirsutissima* do not hold, and *stenophylla* is here retained solely as the small-flowered form of the species. The typical form of the species remains known only from the type collection which was made in 1876 on Angel de la Guarda Island.

257. *Petalonyx linearis* Greene

Petalonyx linearis Greene, Bull. Calif. Acad. Sci. 1:188. 1885.—*Type locality*: Cedros Island.

Seen only on San Luis (3317), Angel de la Guarda (3399), San Pedro Martir (3164), and Tortuga (3605) islands. The species ranges over the northern half of the peninsula and finds its eastern outposts in the islands mentioned. It is a weak bushy shrub which is commonly globose and 3-6 dm. in diameter. On Tortuga Island, where it was found most abundantly, it became 14 dm. high and 18 dm. broad. The plant has light-green leaves and white or pale floral bracts which render it very conspicuous against the dark rock upon which it grows. The large imbricated floral bracts are very numerous, but drop when the bush is shaken or when specimens are pressed. There appears to be considerable variation in the size of flowers, even in a single locality. The plant is characteristic of rocky ground and is usually found on hillsides.

258. *Petalonyx thurberi* Gray

Petalonyx thurberi Gray, Mem. Am. Acad. II, 5:319. 1854.
—*Type locality*: Gila River Valley, Arizona.

Locally frequent in a broad sandy wash back of San Luis Gonzales Bay (3328) where it forms rounded clumps 3-6 dm. high. It is not typical as to foliage, for the leaves are small (5 mm. long) and all about equal length.

259. *Sympetaleia aurea* Gray

Sympetaleia aurea Gray, Proc. Am. Acad. 12:161. 1877.—
Type locality: Pulpito Point, Lower California.

Collected at San Nicolas Bay (3728) within a mile of Pulpito Point, on Ildefonso Island (3741), near Loreto (3796), on Danzante Island (3856), and in a cañon back of Escondido Bay (4110). It was recognized, but not collected, at Agua Verde Bay, Puerto Bailandra on Carmen Island, and at Coyote Bay and Guadalupe Point in Concepcion Bay. The *Sympetaleia* observed in a sterile condition on San Marcos Island probably also belongs here. Brandegee has collections from Comondú and Purisima. From these records, representing nearly if not all the collections of the species, it seems that the plant is restricted to that segment of the peninsula lying between 25° 30' and 27° N. lat.

Like its congeners the species is a cliff plant, and if not actually growing in crevices on the cliff-face, at least grows among the rocks at its base. It is an annual usually forming depressed rounded growths 8-10 cm. high and 1-2 dm. broad, but not infrequently becoming globose in outline, bushy, and 6 dm. in height. It is very striking when in full bloom it then being entirely covered with innumerable salverform vermilion or dilute-yellow flowers. About the type locality, in fact in all but the southern localities, the corollas are vermilion and not golden-yellow as described by Gray. The plant is covered with long sharp hispid hairs that make the handling of it very disagreeable.

260. *Sympetaleia rupestris* (Baill.) Gray

Sympetaleia rupestris Gray in Wats., Proc. Am. Acad. 24:50. 1889.—*Loasella rupestris* Baill., Soc. Linn. Paris 1:650. 1887.—*Type locality*: Guaymas, Sonora.

Collections of this species were made on San Pedro Nolasco Island (3143), Isla Partida (3227), Sal si Puedes Island (3522), and an islet in Guaymas Harbor (3077). The characteristic herbage was seen at Los Angeles Bay, San Francisco Bay, Angel de la Guarda Island, and Tiburon Island. On the peninsula Brandegees made collections from Cajon de Santa Maria on the north to San Pablo on the south. Rose and Standley (Contr. U. S. Nat. Herb. 16:15. 1912) report it from the Pinicate Mountains of northwestern Sonora. The range is hence in the gulf area and north of lat. 28°. It is a sticky cliff plant forming depressed rounded clumps which are usually about 2 dm. in diameter and 1 dm. in height. The leaves are shiny bright green and more or less glutinous above, and dull and non-glutinous below. The flowers are not conspicuous, though the plant itself is, especially when growing against dark lava rock.

261. *Sympetaleia tenella*, n. sp.

A prostrate annual herb, somewhat viscid, branched from the base with the pale branches narrowly winged and sparsely short villous; leaves palmately 5-lobed with unequal lobes and crenate or toothed margins, base truncate or reniform, blade commonly about 15 mm. long and 13 mm. wide on a petiole 1 cm. long but becoming 25 mm. long and 27 mm. wide on petioles 25 mm. long, short villous-hispid with an admixture of a few pustulate-based hairs; flowers axillary; pedicels about 5 mm. long in flower but becoming much elongated (5-7 cm. long) reflexed and tortuous; corolla 5-merous, 4-5.5 mm. long, yellow upon opening but becoming ochroleucous, setose-hispid without and with one particularly long subapical pustulate-based hirsute hair on each lobe, with a distinct tube 1-1.5 mm. long; corolla-lobes spreading, oblong, 3.5-4 mm. long, 2-2.2 mm. wide;

stamens 15-25, in two rows the lower of which is the larger, fixed at the middle of the tube and below, free, divergent; filaments filiform, 4-6 mm. long; anthers single-celled, reniform, attached medially below, dehiscent along a longitudinal groove with the margins reflexed; staminodia none; hypanthium depressed globose, hispid, 2 mm. wide, 1.5 mm. high; sepals oblong, about 1.75 mm. long; capsule 5-valved; ovules in 6 or more series on the parietal placentæ; style filiform without any dilated stigmatic area, about 2.5 mm. long; seeds oblong, spirally grooved, apiculate, about 0.3 mm. long.

Type: No. 1293, Herb. Calif. Acad. Sci., collected May 26, 1923, by I. M. Johnston (no. 3901) in an empty tinaja in a cañon back of **Agua Verde Bay, Lower California.**

This most interesting plant was seen only in a large amphitheater-like cañon in the Sierra Giganta a few kilometers southeast from Agua Verde Bay (3901). It was locally common on the rock-hewn floor of the cañon where due to the lateness of the season only a single green plant was found, in a sheltered nook on the floor of a large dry tinaja. It is a rather pretty little plant, covered, as it is, with many small, star-like flowers and recalling some of the Phacelias.

The plant represents a remarkably distinct new species in that anomalous loasaceous genus, *Sympetaleia*, which has previously had but two known species. *Sympetaleia tenella* differs from its congeners in its very short corolla-tube, few biseriate stamens, and long filaments. It is evidently less evolved than its relatives, showing affinities with *Eucnide*, which it approaches in its long filaments and short corolla-tube. With the addition of *tenella* the crucial characters of *Sympetaleia* become,—stamens with single-celled anthers and inserted in 2 or more rows on the sympetalous corolla. It is highly interesting that the peninsula should have produced three such well-marked species in this peculiar genus. Although *rupestris* and *aurca* seem to range apart, *tenella* appears to find a congenial home within the same area as *aurca*. It seems probable that the new species will be found along the Sierra Giganta when that range has been explored.

LX. CACTACEÆ

262. *Bartschella schumannii* (Hildm.) Britt. & Rose

Bartschella schumannii Britt. & Rose, Cactaceæ 4:58. 1923.
—*Mamillaria schumannii* Hildm., Monatsschr. Kakteenk. 1:125. 1891.—*Mamillaria venusta* K. Brandg., Zoe 5:8. 1900.
—*Type locality*: Not given, but doubtlessly from Lower California.

Infrequent on rocky hillsides at La Paz (4017) forming very flat clusters of 35 or less subglobose unequal heads.

263. *Carnegiea gigantea* (Engelm.) Britt. & Rose

Carnegiea gigantea Britt. & Rose, Jour. N. Y. Bot. Gard. 9:188. 1908.—*Cereus giganteus* Engelm. in Emory, Notes Mil. Recon. 159. 1848.—*Type locality*: Along the Gila River, Arizona.

Seen at Tepoca Bay, Patos Island (3238), Tiburon Island (4281), Pelican Island, and San Pedro Bay. The plants grew on the lower slopes of the rocky hill and were uncommon. Mainly simple and 20-35 dm. high, but the single plant on Patos Island is over 12 m. high and has a single large branch.

264. *Cochemiea poselgeri* (Hildm.) Britt. & Rose

Cochemiea poselgeri Britt. & Rose, Cactaceæ 4:22. 1923.—*Mamillaria poselgeri* Hildm., Gartenzeitung 1885:559. 1885.
—*Mamillaria roseana* K. Brandg., Zoe 2:19. 1891.—*Type locality*: "Süd-Californien," but certainly from Lower California.

Observed on the peninsula and on the adjacent islands at every locality from Ildefonso Island and San Nicolas Bay southward. It forms loose circular patches about 5 dm. broad and 8-15 cm. high. The stems are 2-4 dm. long and have the terminal decimeter ascending with the remaining portion prostrate. The stems are usually rose-colored. (3760, 4083, 4100).

265. *Echinocereus brandegei* (Coul.) Schumann

Echinocereus brandegei Schumann, Gesamtb. Kakteen 290. 1898.—*Cereus brandegei* Coul., Contr. U. S. Nat. Herb. 3:389. 1896.—*Type locality*: El Campo Allemand, Lower California.

Usually growing on rocky hillsides but frequently also on gravelly benches. It forms dense masses 6-9 dm. broad, composed of 40 or less cæspitose heads. It was seen at Mulegé, Coyote Bay (4164), Escondido Bay, Agua Verde Bay, San Evaristo, and La Paz; and on Carmen, Danzante (3858), Santa Cruz (3913), Espiritu Santo, and Ceralbo islands.

266. *Echinocereus engelmanni* (Parry) Rümpler

Echinocereus engelmanni Rümpler in Förster, Handb: Cact. ed. 2. 805. 1885.—*Cereus engelmanni* Parry, Am. Jour. Sci. II, 14:338. 1852.—*Type locality*: About San Felipe, California.

In cæspitose masses on gravelly benches or on hillsides at Tepoca, Los Angeles (3445), Las Animas, and San Francisco bays. Doubtfully referred here are similar plants from San Pedro Bay (4374) which have very slender light-colored spines.

267. *Echinocereus grandis* Britt. & Rose

Echinocereus grandis Britt. & Rose, Cactaceæ 3:18. 1922.—*Type locality*: San Esteban Island.

An insular species seen only on San Pedro Nolasco (3137), San Esteban (3199), North San Lorenzo (4198), and South San Lorenzo (3541) islands where it grows scattered over rocky slopes. The plant is cylindrical, with one or two branches, and has short yellowish-green spines. The flowers are white with the outer segments sometimes tinged lightly with pink.

268. *Echinocereus scopulorum* Britt. & Rose

Echinocereus scopulorum Britt. & Rose, Cactaceæ 3:30. 1922.—*Type locality*: Near Guaymas, Sonora.

Frequent on the hills about Guaymas (3103), San Carlos Bay (4344), and San Pedro Bay (4291). Usually simple and about 2 dm. high. The flowers are very large, and are pink, turning magenta.

Echinocereus sp.

A peculiar species of this genus was found growing in crevices on the cañon walls in the hills back of Los Angeles Bay (3446). Its 3-6 stems were 20-35 cm. long and 4-5 cm. thick, and hung down with their tips ascending. The plants had branches which were loosely affixed, and always produced rootlets about their point of attachment. The spines are acicular and 1-2 cm. long. Dr. Rose believes the plant to be undescribed.

269. Ferocactus alamosanus Britt. & Rose

Ferocactus alamosanus Britt. & Rose, Cactaceæ 3:137. 1922.—*Echinocactus alamosanus* Britt. & Rose, Contr. U. S. Nat. Herb. 16:239, t. 66. 1913.—*Type locality*: Alamos Mountains, Sonora.

Occasional on the hillsides at the head of San Carlos Bay (4348) where the huge plants became 15 dm. high and 5 dm. broad. The flowers are a clear lemon yellow.

270. Ferocactus diguetii (Weber) Britt. & Rose

Ferocactus diguetii Britt. & Rose, Cactaceæ 3:131. 1922.—*Echinocactus diguetii* Weber, Bull. Mus. Hist. Nat. Paris 4:100. 1898.—*Type locality*: Catalina Island.

Occurring on Coronados, Carmen, Danzante, Catalina (4098), San Diego, and Ceralbo (4037) islands, growing on rocky hillsides or on gravelly benches. Frequent on Carmen and Ceralbo islands, but abundant on Catalina Island where it is the most characteristic plant. The largest plants were seen on Catalina Island where plants over 3 m. high were not uncommon and the average measurements were 10-15 dm. high and 4-5 dm. broad. The number of ribs varies from 24 to 37. The flowers are reddish.

271. *Ferocactus johnstonianus* Britt. & Rose

Ferocactus johnstonianus Britt. & Rose, *Cactaceæ* 4:287. (1923).—*Type locality*: Lagoon on Angel de la Guarda Island.

This species is known only from collections made back of the lagoon on the east shore of Angel de la Guarda Island (3394, 3395). About 50 plants were observed growing on a gravelly plain. The species is obviously related to *F. diguetii*, of the southern gulf islands, but is clearly distinct in its small size, much more numerous spines and yellow flowers.

272. *Ferocactus wislizeni* (Engelm.) Britt. & Rose

Ferocactus wislizeni Britt. & Rose, *Cactaceæ* 3:127. 1922. —*Echinocactus wislizeni* Engelm. in *Wisliz.*, Mem. No. Mex. 96. 1848.—*Type locality*: Near Dona Ana, New Mexico.

Barrel-cacti of the *F. wislizeni* group are frequent in the gulf area. Spines are very variable in length and breadth, even in a single colony (3453, 3454, 4085a, 4162, 4163, 4190). The plants on San Josef Island (3935, 4084) are similar in general habit but are unique in the possession of a distinct central woody core. The plants on Tiburon Island (4251, 4270) have notably stout terete spines.

Ferocactus sp.

A ponderous species, which becomes 15 dm. high and 7 dm. broad, is frequent on the hillsides about San Pedro Bay (4292). It belongs to the same immediate group as *F. diguetii* and much resembles that species in habit.

273. *Lemaireocereus thurberi* (Engelm.) Britt. & Rose

Lemaireocereus thurberi Britt. & Rose, *Contr. U. S. Nat. Herb.* 12:426. 1909.—*Cereus thurberi* Engelm., *Am. Jour. Sci.* II, 17:234. 1854.—*Type locality*: Near Bachuachi Pass, Sonora.

On the peninsular side of the gulf this species was present on every island, with the sole exception of Catalina Island, and at every peninsular station south of Mulegé. On the Sonoran side of the gulf it was seen at Tepoca Bay, Tiburon Island,

San Pedro Bay, San Pedro Nolasco Island (?), and Guaymas. It is branched at the base with numerous ascending branches that become 2-4 m. high. It grows scattered over gravelly benches and rocky hillsides. There is considerable variation as to the time of opening and closing of flowers. On Carmen Island the flowers opened after dark and closed before 8 o'clock in the morning. On Ceralbo Island flowers in full sunlight were noted as open at 10:30 a.m. and at 2:30 p.m. At San Evaristo Bay open flowers were seen as late as 4 p.m.

274. *Lophocereus schottii* (Engelm.) Britt. & Rose

Lophocereus schottii Britt. & Rose, Contr. U. S. Nat. Herb. 12:427. 1919.—*Cercus schottii*, Engelm., Proc. Am. Acad. 3:288. 1856.—*Type locality*: Near Magdalena, Sonora.

Seen on Tiburon, Partida, Tortuga, San Marcos, Inez, Ildefonso, Coronados (3763), Carmen, Danzante, Monserate, San Diego, Santa Cruz, San Josef, and San Francisco islands; and at Tepoca Bay, Los Angeles Bay, Las Animas Bay, San Francisquito Bay, Santa Rosalia, Guadalupe Point, San Nicolas Bay, Loreto, Escondido Bay, San Evaristo, and La Paz. It is a light-green, stout, usually 5-ribbed cactus with only a few ascending stems 1-3 m. high. It reaches its best development in gravelly soil, but also occurs on hillsides. Called "garambullo" or "hombre viejo."

275. *Machærocereus gummosus* (Engelm.) Britt. & Rose

Machærocereus gummosus Britt. & Rose, Cactaceæ 2:116. 1920.—*Cercus gummosus* Engelm. in Brandg., Proc. Calif. Acad. Sci. II, 2:162. 1889.—*Cercus cumengei* Weber, Bull. Mus. Hist. Nat. Paris 1:317. 1895.—*Type locality*: Northwestern Lower California, probably about Ensenada.

One of the most common and characteristic cacti on the peninsula. It was seen at all stations in Lower California from Los Angeles Bay southward (3797, 4141, 4188), and on Tiburon, San Esteban, and Angel de la Guarda islands southward on all the islands along the peninsular shore. Growing on alluvial plains and on gravelly benches, and occurring, but less abundant, on rocky hillsides. It usually forms erect loose growths 1-2 m. high. At most localities it grew in scattered

though frequent groups and did not form such a formidable barrier as on the slightly elevated bench just north of Loreto where an area several square kilometers in extent would be impenetrable were it not traversed by sinuous cattle trails. The flowers are white within and a deep rose-color outside. They close before noon. The plant is well known under the name of "pitahaya agre." It may be questioned whether *C. gummosus* is actually described at the reference given. If a hyponym then Weber's name must be accepted.

276. *Neomammillaria albicans* Britt. & Rose

Neomammillaria albicans Britt. & Rose, Cactaceæ 4:138. 1923.—*Type locality*: Santa Cruz Island.

Frequent on the rocky slopes of Santa Cruz (3912) and San Diego (3923) islands. The plants are simple or occasionally with a single branch. The stems are 5-8 cm. high and 20-25 mm. thick.

277. *Neomammillaria cerralboa* Britt. & Rose

Neomammillaria cerralboa Britt. & Rose, Cactaceæ 4:116. 1923.—*Type locality*: Ceralbo Island.

This is a tawny plant with mainly unhooked spines, and is frequent on the hillsides and in gravelly washes on Ceralbo Island (4038, 4053). It is cylindrical, solitary or with one branch, and is 10-15 cm. high.

278. *Neomammillaria evermanniana* Britt. & Rose

Neomammillaria evermanniana Britt. & Rose, Cactaceæ 4:97. 1923.—*Type locality*: Ceralbo Island.

Small and depressed globose, and found growing wedged in crevices of a rocky cliff along the cañon-side on Ceralbo Island back of El Mastrador (4058). Other lactiferous species closely related to *N. evermanniana* were collected on Espiritu Santo Island (3985) and in the mountains back of Escondido Bay (4142).

279. *Neomammillaria johnstonii* Britt. & Rose

Neomammillaria johnstonii Britt. & Rose, Cactaceæ 4:80. 1923.—*Type locality*: San Carlos Bay, Sonora.

Frequent on the barren volcanic hillsides at San Carlos (4373) and San Pedro (4342) bays, forming coarse depressed-globose heads 15 cm. broad.

280. *Neomammillaria slevinii* Britt. & Rose

Neomammillaria slevinii Britt. & Rose, Cactaceæ 4:139. 1923.—*Type locality*: San Josef Island.

A pallid, simple or rarely branched plant 5-8 cm. high and 20-25 mm. thick. It is frequent on the rocky slopes of San Francisco Island (3943). Rose collected the species on San Josef Island.

281. *Neomammillaria swinglei* Britt. & Rose

Neomammillaria swinglei Britt. & Rose, Cactaceæ 4:158. 1923.—*Type locality*: Guaymas, Sonora.

Very common on a scorice-covered islet in Guaymas Harbor (3086). It is commonly simple but occasionally produces as many as six very unequal heads.

***Neomammillaria* sp. or spp.**

A group of mamillarias, related to or perhaps to be included in *N. armillata* (K. Brandg.) Britt. & Rose, or *N. fraileana* Britt. & Rose, is represented on nearly all the gulf islands and at many points on the peninsula and mainland. In the large series of specimens collected there is considerable diversity in stoutness, length, color, and number of the spines, as well as in the stoutness of the habit, and so it seems not improbable that there are several species represented. The plants grow on rocky slopes and gravelly benches and are very similar in habit, forming cylindrical or clavate growths 5-30 cm. high and 3-6 cm. thick. They are simple or occasionally have one or two strict branches. (3198, 3369, 3542, 3543, 3589, 3738, 3746, 3761, 3812, 3833, 3834, 3862, 3864, 3924, 3933, 3934, 3941, 3988, 4000, 4018, 4039, 4059, 4086b, 4099, 4183, 4186, 4187, 4230, 4290, 4339, 4381, 4418).

Neomammillaria sp.

Much branched, forming loose caespitose masses of 40 or fewer stems. The stems are 5-8 cm. long and 20-25 mm. thick. Frequent on the rocky slopes of San Pedro Nolasco Island (3112). Related to *N. albicans* and *N. slevanii*.

Neomammillaria sp.

Infrequent in rock-crevices along the crest of San Pedro Nolasco Island (3121). The plants are depressed globose and are single or are compactly caespitose with 4-5 heads. The flowers are magenta and the stamens are yellow. A very neat lactiferous species with tomentose upper tubercules.

282. **Opuntia bigelovii** Engelm.

Opuntia bigelovii Engelm., Proc. Am. Acad. 3:307. 1856.
—*Type locality*: Big Williams River, Arizona.

Growing at Kino Point and Tepoca Bay, and on Tiburon and San Esteban (?) islands. Not particularly common.

283. **Opuntia burrageana** Britt. & Rose

Opuntia burrageana Britt. & Rose, Cactaceæ 1:70, t. 14, f. 1. 1919.—*Type locality*: Near Pichilique Island, Lower California.

This species, and probably several related ones of similar aspect, are common on the islands and gulf shore from Cerralbo to San Pedro Martir, San Esteban, and San Luis islands. The cylindropuntias in question were not seen on Catalina, Inez, or Tortuga islands, but were rather common elsewhere within the range mentioned. The plants usually grow with *O. cholla* but are less stout, of a different green, grow less tall, and have lower more close-set tubercules.

284. **Opuntia cholla** Weber

Opuntia cholla Weber, Bull. Mus. Hist. Nat. Paris 1:320. 1895.—*Type locality*: Lower California.

This is the common cylindropuntia on every island and about every peninsular locality from San Marcos Island and Mulegé

southward. The species reaches its best development on sandy plains where it frequently forms large thickets. It grows 1-2 m. high and usually has one to several trunks. A plant seen at San Francisquito Bay may be this or a closely related species.

285. *Opuntia ciribe* Engelm.

Opuntia ciribe Engelm. in Coult., Contr. U. S. Nat. Herb. 3:445. 1896.—*Type locality*: Lower California.

What is probably this species was observed at San Francisquito, Las Animas, and Los Angeles bays; and on Angel de la Guarda, Smiths, Partida, San si Puedes (?), South San Lorenzo, Tortuga, and Santa Cruz (?) islands. The stems are stout and tawny and suggest those of its near relative, *O. bigelovii*, from which it differs conspicuously in its open habit of growth and elongate lateral branches.

286. *Opuntia clavellina* Engelm.

Opuntia clavellina Engelm. in Coult., Contr. U. S. Nat. Herb. 3:444. 1896.—*Type locality*: Near Purisima, Lower California.

Doubtfully referred here are cylindropuntias from Tortuga (4184), Santa Cruz (3914), and Ceralbo islands. The Tortuga plants are stout-spined, self-supporting, widely branched, and 4-9 dm. high, but the other plants have slender spines and are usually partially supported by bushes.

287. *Opuntia comoduensis* (Coult.) Britt. & Rose

Opuntia comoduensis Britt. & Rose, Smiths. Miscel. Coll. 50:519. 1908.—*Opuntia angustata* var. *comoduensis* Coult., Contr. U. S. Nat. Herb. 3:425. 1896.—*Type locality*: Comodú, Lower California.

Seen on the peninsula only at La Paz, but present on all the western gulf islands, except Catalina, from Espiritu Santo to Coronados (3762). It is a yellowish-green plant with long, slender, deflexed spines, which grows singly and forms growths about a meter high. It is the only platyopuntia on the islands off the peninsular shore.

288. *Opuntia gossilini* Weber

Opuntia gossilini Weber, Bull. Soc. Acclim. France 49:83. 1902.—*Type locality*: Coast of Sonora probably from Guaymas.

This purplish jointed platyopuntia is common on the rocky slopes about San Carlos Bay and over the slopes of the islands in Guaymas Harbor.

289. *Opuntia invicta* Brandg.

Opuntia invicta Brandg., Proc. Calif. Acad. Sci. II, 2:163. 1889.—*Type locality*: San Juanico, Lower California.

Observed only at San Francisquito (3550) and San Nicolas bays where it grows on hillsides or gravelly benches, and forms dense colonies about a meter broad. In habit and spines the plant bears little resemblance to the common types of *Opuntia*, most resembling *Echinocereus*, having oblong joints about 1 dm. long and 5-8 cm. thick which are covered with very coarse, straight, angled spines that much resemble those of *Machero-cereus gummosus*. The joints are the erect green portion of trailing stems. The stems die back of the growing parts. They are constantly dichotomously branching and by the dying of the common stems forming new plants.

290. *Opuntia leptocaulis* DC.

Opuntia leptocaulis DC., Mem. Mus. Hist. Nat. Paris 17:118. 1828.—*Type locality*: Mexico.

Rare on a gravelly plain at San Pedro Bay (4341) forming bushy masses 6-9 dm. high.

Opuntia sp.

A cylindropuntia apparently related to *O. cholla* is common on Raza and Pond islands. It is characterized by the habit of bearing enormous amounts of pendent many-jointed fruit.

Opuntia spp.

Unknown platyopuntias were seen at Escondido Bay (4140), and on Pelican and San Pedro Nolasco islands. There are three different species.

291. *Pachycereus pringlei* (Wats.) Britt. & Rose

Pachycereus pringlei Britt. & Rose, Contr. U. S. Nat. Herb. 12:422. 1909.—*Cereus pringlei* Wats., Proc. Am. Acad. 20:368. 1885.—*Type locality*: South of the Altar River, Sonora.

This is one of the most characteristic plants of the gulf area, and is one of the feature-forming elements of nearly every landscape. With the exception of Georges Island and Tepoca Bay (?) the plant was present in varying abundance at every station in the area. It grows with equal abundance on gravelly plains and on rocky hillsides. There is considerable variation in habit of growth. The common form is one with a distinct trunk 1-2 m. high which supports a crown of very thick upright branches. The whole plant is 3-9 m. high. In some localities the plants are simple. The most pronounced variation in habit is that characteristic of the plants on San Pedro Martir Island (3160). These are trunkless or nearly so, the branches starting from near the ground and making the plant appear like monstrous specimens of *Lemaurocereus thurberi*. This trunkless form was seen on most of the northern gulf islands. The fruit is usually dry, but on Catalina it splits at maturity in an irregular stellate manner and discloses a purplish-pink fleshy inner layer of tissue. The young plants are commonly covered with spines 1-3 cm. long, but as the stems get older they tend to lose their armature. The plants on Espiritu Santo and Cerralbo islands seem to have exceptionally long spines, these becoming over a decimeter in length on the trunks of young plants.

292. *Pilocereus johnstonii* Britt. & Rose

Pilocereus johnstonii Britt. & Rose, Jour. Wash. Acad. Sci. 12:329. 1922.—*Type locality*: San Josef Island.

Known only from a few plants found growing in sandy soil at San Nicolas Bay (3737) and on San Josef Island (3940, 4085). It usually grows up through *Oleña*, partially supported by it, and very much simulating the dead branches of that spiny tree.

293. *Rathbunia alamosensis* (Coul.) Britt. & Rose

Rathbunia alamosensis Britt. & Rose, Contr. U. S. Nat. Herb. 12:415. 1919.—*Cereus alamosensis* Coul., Contr. U. S. Nat. Herb. 3:406. 1896.—*Type locality*: Near Alamos, Sonora.

Locally common on a gravelly cañon floor at the head of San Carlos Bay (4347). It much resembles *Macharocereus gummosus* in form and general habit, but is more slender and lighter green. The plants grow 9-12 dm. high with many weak differently appearing trailing stems about the base of the stout erect flowering ones. The flowers are scarlet.

294. *Wilcoxia striata* (Brandg.) Britt. & Rose

Wilcoxia striata Britt. & Rose, Contr. U. S. Nat. Herb. 12:434. 1909.—*Cereus striatus* Brandg., Zoe 2:19. 1891.—*Cereus diguetii* Weber, Bull. Mus. Hist. Nat. Paris 1:319. 1895.—*Type locality*: San José del Cabo, Lower California.

Frequent on the rocky benches bordering the salt-lagoon on Carmen Island (4146). A single large plant was found on a gravelly bench in a cañon on San Marcos Island (4179). The roots which radiate from the plant less than a decimeter under the ground, are thickened about 1-3 dm. from the plant to form large fusiform tubercules. These tubercules vary considerably in abundance, for some plants have only one or two while others have as many as 50. In size the tubercules vary from 5-20 cm. in length and from 5-60 mm. in thickness. It is estimated that the large plant taken on San Marcos Island had 5 kg. of tubercules. The average plant has about 1 kg. The plant grows 3-6 dm. high and has an erect stem 15-20 cm. high which is branched above into horizontal or arcuately recurved branches 15-20 cm. long and of the thickness of a lead pencil. It is a difficult plant to find, due to its small size and general resemblance to a dead leafless shrub. It was called "tracamatra" by a worker at the saltworks, "matraca" by one of the sailors, and "caramatra" by a native on San Marcos Island. The tubercules are cut in two and applied over the lungs for ailments of those organs. Rose collected the species on San Josef Island.

LXI. RHIZOPHORACEÆ

295. *Rhizophora mangle* L.

Rhizophora mangle L., Sp. Pl. 443. 1753.—*Type locality*: Caribbean Sea.

The mangrove was noted in the still waters of esteros and bays at Las Animas Bay (3492), Mulegé (3657), Coyote Bay, Puerto Ballandra on Carmen Island (3822), Danzante Island, Escondido Bay, San Josef Island, Espiritu Santo Island, and La Paz on the peninsula side of the gulf; and at San Carlos Bay and Guaymas on the mainland. The Las Animas station, where a single puny bush was found, probably represents the northernmost station on the Pacific Coast; the locality is at about 28° 50' N. lat. The finest plants were seen at Coyote Bay where they became arborescent and over 9 m. in height.

LXII. COMBRETACEÆ

296. *Laguncularia racemosa* (L.) Gaertn.

Laguncularia racemosa Gaertn., Fruct. et Sem. 3:209, t. 217, f. 3. 1805.—*Conocarpus racemosus* L., Syst. ed. 10, 930. 1759.—*Type locality*: Not given.

Seen only at Mulegé (3658), Coyote Bay, Carmen Island, Danzante Island, Escondido Bay, Agua Verde Bay (3908), San Josef Island, Espiritu Santo Island (4071), La Paz, and San Carlos Bay. The most northern observed station is San Carlos Bay where it is common at 28° N. lat. It was most common at Mulegé and La Paz where it grows with *Rhizophora* on shallowly submerged land along esteros. A small tree 24-45 dm. high.

LXIII. ONAGRACEÆ

297. *Oenothera angelorum* Wats.

Oenothera angelorum Wats., Proc. Am. Acad. 24:49. 1889.—*Type locality*: Los Angeles Bay, Lower California.

Referred here are the common yellow-flowered annuals that grow on the sands at San Francisquito Bay (3572). The plant has strict or ascending stems 3-6 dm. long which were leafless

at the time of collecting. An erectly growing annual seen on San Luis Island may also be referable here.

Young plants of *O. angelorum* superficially resemble *O. leptocarpa* (*Eulophus californicus*), but the contorted fruit which commonly occurs near the base of the plant, the laxer habit of growth, and the longer hypanthium, all amply distinguish *angelorum*. The closest ally of the latter species seems to be *O. scapto stigma* Brandg. (Proc. Calif. Acad. Sci. II, 2:156. 1889) which comes from the western middle section of the peninsula. Brandegee's species seems to differ only in habit, being acaulescent or having a few short trailing stems. The petals on the type of *scapto stigma* are 15 mm. long, but in some other collections the petals are only 6 mm. long and well within the size of *angelorum*. *Oenothera crassiuscula* Greene (Pittonia 1:290. 1889) from San Bartolomé Bay belongs to the same immediate group of species and may be the same as *scapto stigma*, although the habit is not correctly described for that species.

298. *Oenothera cardiophylla* Torr.

Oenothera cardiophylla Torr., Pacif. R. R. Rep. 5:360. 1856.
—*Chylisma cardiophylla* Small, Bull. Torr. Cl. 23:193. 1896.
—*Type locality*: Near Fort Yuma, California.

Seen only at San Luis Gonzales Bay (3339), and on San Luis (3318), Angel de la Guarda (4232), San Pedro Martir (3147), and San Marcos (3636) islands. It was collected from gravel, silt, and gypsum. It tends to become perennial and to be as much as 9-12 dm. high. The southern limit for the species appears to be about lat. 27° N.

LXIV. UMBELLIFERÆ

299. *Eryngium nasturtiifolium* Juss.

Eryngium nasturtiifolium Juss. in Delar., Eryng. 46, t. 17. 1808.—*Type locality*: Central America.

A few plants were found growing in gravelly soil about some dried springs in the cañon at the head of San Carlos Bay (4359). It is prostrate and becomes as much as 7 dm. broad.

LXV. THEOPHRASTACEÆ

300. *Jacquinia pungens* Gray

Jacquinia pungens Gray, Mem. Am. Acad. II, 5:325. 1855.
—*Type locality*: Hills between Rayon and Ures, Sonora.

Growing on alluvial plains at Guaymas (3113), San Pedro Bay (4295), and on the south end of Tiburon Island (4274). At Guaymas it formed only shrubby hedge-like growths 15-25 dm. high, but elsewhere it commonly formed a very dense tree 6-8 m. high. The trunk and limbs of the plant are ponderous, covered with dark, thin, rather smooth bark, and composed of a very weak brash wood. The trees seen were covered with nuts and the ground under them littered with shells left by rodents.

LXVI. PRIMULACEÆ

301. *Samolus ebracteatus* H.B.K.

Samolus ebracteatus H.B.K., Nov. Gen. et Sp. 2:223, t. 129. 1817.—*Type locality*: Cuba.

On San Marcos Island (3631) this plant was often locally abundant about moist, salt-incrusted areas on the bottom of gypsum ravines. A few plants were found at Loreto (3799) growing in a saline spot near the ocean. The flowers are a definite pink in color.

LXVII. SAPOTACEÆ

302. *Bumelia occidentalis* Hemsley

Bumelia occidentalis Hemsley, Biol. Centr. Amer. Bot. 2:298. 1881.—*Bumelia fragrans* Brandg., Zoe 5:106. 1901.—*Bumelia brandegei* Blake, Contr. Gray Herb. II, 52:76. 1917.—*Type locality*: "Sonora Alta".

Referred here are collections from Agua Verde (3904), San Pedro (4296), and San Carlos (4367) bays. The plants are large, upright, very spinescent shrubs 25-30 dm. high, which commonly form colonies in alluvial soil. The flowers, which are produced in great abundance, are pale yellow and strongly fragrant with a honey-like odor. The fruit is oblong

with a light-colored, sweetish flesh, and a black, slightly glaucous skin.

The determination is not entirely satisfactory. The Agua Verde plants have very large flowers, long acuminate anthers, and other minor floral differences; whereas the San Pedro collection has smaller flowers, truncate staminodia, and subequal petals and appendages. A study of the material in the Brandegee collection shows so much variation, and so little uniformity in corolla structures that one can justly question their value for specific differentiation. The type of *B. fragrans* and a Purpus collection (319) seem to agree, particularly so in the brown, lightly pubescent sepals. Future collections may validate *fragrans*, but at present it should not be recognized when better marked forms go unnamed.

303. *Sideroxylon leucophyllum* Wats.

Sideroxylon leucophyllum Wats., Proc. Am. Acad. 24:59. 1889.—*Type locality*: Los Angeles Bay, Lower California.

Trees representing this species were found on Angel de la Guarda Island (3365, 3409), Los Angeles Bay (3438, 3485), and Las Animas Bay (3507). Previously it has been known only from the original collection at Los Angeles Bay (*Palmer 516*) and from about 115 km. farther north at Cañon de Santa Maria (*Brandegee*). The plant varies considerably in habit and habitat. On the peninsula, it was found only on dry rocky mountain sides, usually in open gulches and forming an erect, very heavy-trunked, scraggly tree 30-45 dm. high. On Angel de la Guarda Island, where it was collected at the north and south ends, it grew on rocky mountain sides but occurred as well along the borders of gravelly washes and formed a widely spreading, open tree 6 m. in height. The bark on the trunk is thick, furrowed, and fibrous. The milky sap quickly solidifies upon exposure to air into hard masses and forms good chewing gum. On trees growing on hillsides there is a striking dimorphism in foliage. The leaves on the lower branches are only 15-30 mm. long and 6-8 mm. wide, and are commonly lightly tomentose; whereas the leaves on the vigorous long flowering stems are 5-9 cm. long, 2-4 cm. broad, and white with a close, dense tomentum. No mature fruit was collected,

but, judging from pieces picked up from under the trees, it must be globular, tomentose, 18-22 mm. broad, and only two-seeded. The ovary is densely tomentose and 5-celled.

LXVIII. EBENACEÆ

304. *Maba intricata* (Gray) Hiern

Maba intricata Hiern, Trans. Cambr. Philos. Soc. 12:126. 1872.—*Macreightia intricata* Gray, Proc. Am. Acad. 5:163. 1862.—*Type locality*: Cape San Lucas, Lower California.

On Ceralbo Island (4048, 4054) this plant is the prevailing and characteristic shrub along the cliffs and on the steep slopes near or facing the shore. While most abundant along the shore it is not confined there, for at El Mastrador it extends inland along a steep cañon wall for a half kilometer. The plant is a dense, pale-barked shrub 3-25 dm. high and 1-2 m. broad. When growing in exposed situations it assumes a flat-topped, hedge-like habit, but when sheltered it forms a comparatively loose growth and has a rounded crown. The ground beneath the plant is deeply covered with old leaves. The fruit seems to be a rich reddish brown and is glabrous when mature; it appears to be relished by rodents. This *Maba* is treated as *Diospyros texana* by Goldman (Contr. U. S. Nat. Herb. 16:359. 1916. Brandegee (Proc. Calif. Acad. Sci. II, 3:150. 1891) has given a detailed redescription of the species with which the collected material fully accords.

It can be noted here that the persimmon of the Cape region is not closely related to *Diospyros texana*. The plant that Brandegee first (Zoe 4:404. 1894) called *D. texana*, and later designated as the variety *californica* (Zoe 5:164. 1903), should be dissociated from *D. texana* and called ***Diospyros californica***, n. comb. The relationships of the plant are with the trees of western Mexico recently described by Standley (Contr. U. S. Nat. Herb. 18:119-121. 1916.). The peninsular material consists of a glabrate form and one that is brownish with a dense villous tomentum. Brandegee has indicated a tomentose specimen from the "cape region" as the type of his *californica*. The glabrate form, represented by his collection from San Bernardo, may be called ***Diospyros californica*** var. ***tonsa***, n. var.

LXIX. OLEACEÆ

Forestiera sp.

An indeterminable species of *Forestiera* was found to be infrequent on the rocky bed of a cañon at the head of Candeleros Bay on Espiritu Santo Island (4078). It formed a large green shrub 18-24 dm. high. The collected material seems similar to topotypic material of *F. phillyreoides* (Benth.) Torr.

LXX. APOCYNACEÆ

305. *Macrosiphonia hesperia*, n. sp.

A shrub 7-10 dm. high, with numerous widely-branched, very loosely-tufted stems; younger parts with a dense brownish pubescence; leaves opposite, ovate or orbicular-ovate, white-tomentose below, green and velvety hirsute above, blade 2-3 cm. long, 18-24 mm. wide, base obtuse or rounded, apex short mucronate, petioles about 4 mm. long; flowers terminal, solitary or frequently geminate, on stoutish pedicels 4-17 mm. long; calyx oblong or oblong-spathulate, about 8 mm. long at anthesis, densely brownish hirsute outside, inside glabrous and below with pectinately arranged glands (ca. 8-10 per sepal); flowers 6-7 cm. long, glabrous, tube slender being 1-1.5 mm. wide and 4-5 cm. long, throat cylindrical 8 mm. long and 3-4 mm. wide, lobes obliquely cuneate-obovate and about 13 mm. long and 1 cm. wide; follicles usually 10-12 cm. long, somewhat torose, canescent with a fine antrorse pubescence, with 5 erect plate-like glands arranged about base; seeds oblong or linear, wrinkled, 5-8 mm. long; coma copious, equalling or shorter than the seed.

Type: No. 1294, Herb. Calif. Acad. Sci., collected May 21, 1921, by I. M. Johnston (no. 3807) from about cliffs back of **Puerto Ballandra, Carmen Island, Gulf of California.**

This shrub appears to have a wide range along the southern part of the gulf shore of the peninsula. It was noted on Carmen (3807), Catalina, Santa Cruz, Espiritu Santo (3984), and Ceralbo islands; and at Escondido and Agua Verde (3888) bays. The only previous record is that regarding Palmer's collection on Carmen Island (Contr. U. S. Nat. Herb. 1:132. 1892). The plant affects rocky ground and usually

grows where sheltered by cliffs. It is a true shrub, commonly having many very loosely tufted stems which are frequently coarse and very twiggy. The species is most closely related to *M. macrosiphon*, but differs in having a widely-separated range, much smaller, glabrous flowers, and shrubby habit.

306. *Vallesia glabra* (Cav.) Link

Vallesia glabra Link, Enum. Pl. 1:207. 1821.—*Rouwolfia glabra* Cav., Icones 3:50, t. 297. 1795.—*Type locality*: "Nova Hispania".

At Mulegé (3694), Loreto, Carmen Island, Escondido Bay, and La Paz (3026) this shrub was noted on subalkaline sandy soil. It produces hundreds of slender stems and forms a dense erect tufted growth 18-26 dm. high. The fruits and flowers are white, but the latter dry a bright orange. Several different people at La Paz called the plant "otatabe".

LXXI. ASCLEPIADACEÆ

307. *Asclepias albicans* Wats.

Asclepias albicans Wats., Proc. Am. Acad. 24:59. 1889.—*Type locality*: Ravine near Los Angeles Bay, Lower California.

Collected on Tortuga (3608), South San Lorenzo (4193), San Esteban (3181), and Angel de la Guarda (3389, 4222) islands; also at San Luis Gonzales Bay (3350). The plant has a few strict branches which are distinctly woody below and as much as 35-40 mm. thick, 3 dm. above ground. The long, very glaucous whip-like branches are usually drooping at the apex, so that, although the stems may become 18-36 dm. high, the actual length of the plant is frequently much greater. No particular habitat seems favored, the plant growing in sandy washes, on gravelly benches, or on scoriæ-covered hill-sides. In the Brandegee collection there are collections from La Paz and Magdalena Bay. The species is most nearly related to *A. subulata* from which it conspicuously differs in flowers, the bud being obovate instead of globose in shape, and the hoods twice exceeding the stamens instead of exceeded by them. *Asclepias albicans* frequently has ternate leaves but

subulata has them consistently opposite. The strict little-branched woody habit seems to be characteristic of the species, but observations are not complete enough to warrant such a statement as an established fact. Future collectors may well keep this point in mind.

308. *Asclepias leptopus*, n. sp.

Loosely much-branched from a suffrutescent base, 4-6 dm. high; stems slender, glabrous, green or lightly glaucous about the nodes; leaves all opposite, filiform with revolute margins, attenuate below, 4-7 cm. long, 0.7-1.5 mm. wide, deciduous; umbels 3-8 flowered, usually terminal in groups; peduncles 0-2 cm. long; pedicels slender, villous-puberulent, 9-15 mm. long; sepals 1.9 mm. long, linear-oblong, not firm; petals reflexed, nearly white, oblong, 5 mm. long, about 2 mm. wide; column evident, higher (by 1.0-1.1 mm.) than broad (0.7-0.9 mm.); hood broadly ovate when flattened out but appearing oblong in position, 3 mm. long, exceeding the stamens by 0.3-1 mm. entire, orange with a broad maroon medial line marking the insertion of the horn; horn adnate to the hood for about $\frac{2}{3}$ length of latter and slightly exceeding it, claw-like, incurved and arching over stamens, about 2 mm. long; follicles ascending or arrect (at least not erect), smooth, glabrous, linear-lanceolate, 3.5-4 cm. long, about 3.5 mm. wide; seeds light brown, about 2 mm. long, with a coma 1 cm. long.

Type: No. 1295, Herb. Calif. Acad. Sci., collected July 8, 1921, by I. M. Johnston (no. 4377) from crevices of a tufa cliff at the head of **San Carlos Bay, Sonora**.

Found locally common in crevices on a tufa cliff that overhangs the mangrove lagoon at the head of San Carlos Bay (4377). It grows in loose, leafless clumps and suggests a very slender form of *A. albicans*. In the National Herbarium there is a very good match for the type of *A. leptopus* in a specimen which was collected near Nacapuly, 15 miles west of Guaymas (*Palmer 256*, determined as *A. galioides*). Two Sinaloan collections by Brandegee seem referable to the species; one from Cerro Colorado seems to be typical *A. leptopus*, but was referred by its collector to *A. mexicana* (*Zoe 5:216*. 1905), while the second, from Altata, is atypical and larger in all its

parts and was referred to *A. albicans* (loc. cit.). The new species has the aspect and habit of *A. macrotis* Torr., but has very different floral structures. It seems related to *A. albicans*, but Watson's species is a large, very glaucous plant with quite different corona. The outstanding features of *leptopus* are its habit, opposite leaves, and coronal development.

309. *Asclepias subulata* Decaisne

Asclepias subulata Decaisne in DC., Prodr. 8:571. 1844.—*Type locality*: "Nova Hispania?"

Collected at La Paz (3060), Mulegé (3689), and Kino Point (4284). It is a very densely tufted plant becoming 3-12 dm. high and always growing in sandy or gravelly soil. At Kino Point it grows on the dunes along the beach. It was called "jumente" at La Paz and its diluted milk reputed to be a violent cathartic. *Asclepias subulata* seems to be more abundantly lactiferous than *A. albicans*, and to have a less thick waxy glaucous coating on the stems. The two species were not found growing together, though they must do so at La Paz where Brandegee and Palmer collected the latter and I the former. The species is known only from Sonora, Lower California, Arizona, and California, and so could hardly have been collected by Pavon as originally given. Although this fact raises a doubt as to the proper application of the name to our plant, *A. subulata* is here taken up with some assurance due to Decaisne's faithful, albeit brief description of the plant in mind.

310. *Cynanchum palmeri* (Wats.) Blake

Cynanchium palmeri Blake, Contr. Gray Herb. II, 52:83. 1917.—*Patalias palmeri* Wats., Proc. Am. Acad. 24:60. 1889.—*Cynanchum peninsulare* Blake, Contr. Gray Herb. II, 52:83. 1917.—*Type locality*: Mulegé, Lower California.

Climbing up through, and forming tangles in, shrubs at San Marcos Island (3620) where it grew on talus footing gypsum cliffs, at Mulegé (3685) where a single plant was found at the foot of a bare rocky over-grazed hill, and at Espiritu Santo Island (3965) where it grew in rocky gulches. The plant is perennial from a taproot and produces a number

of stems, the lower meter of which is covered with a deeply and irregularly much-furrowed, thick, pale corky bark. The peculiar corky bark is by far the most conspicuous feature of the plant. The follicles are smooth, shiny, and have a purplish brown mottling on a whitish ground color. The petals are wholly greenish yellow or in the southern plants sometimes margined with brownish. Blake has proposed a species to include the coarser plants from the cape region, but that development is better called *Cynanchum palmeri* var. *peninsulare*, n. comb. The Espiritu Santo collection is referable to the variety. Brandegee (*Zoe* 5:165. 1903) has a note on the plant of the cape region.

311. *Marsdenia edulis* Wats.

Marsdenia edulis Wats., Proc. Am. Acad. 24:61. 1889.—*Type locality*: On sandy saline mesas near saltwater at Guaymas, Sonora.

This coarse twiner was collected at Guaymas (3118), San Carlos Bay (4370), and San Pedro Bay (4306). It is not restricted to saline soils, as Watson's statement would suggest, for it grows over shrubs (usually armed) in gravelly washes and in cañons well back from the ocean. The plant forms a very open network of stems and not the matted tangled masses so characteristic of some other asclepiads. The fruit is elliptic-oblong, 7 cm. long and 3 cm. wide, with a horny peridium whose surface is smooth and light brown. At Guaymas it was called "tallote."

312. *Funastrum lineare* var. *heterophyllum* (Engelm.) Macbr.

Funastrum lineare var. *heterophyllum* Macbr. Contr. Gray Herb. II, 49:50. 1910.—*Philibertia linearis* var. *heterophylla* Gray, Syn. Fl. N. A. 2:88. 1878.—*Sarcostemma heterophylla* Engelm. in Torr., Pacif. R. R. Rep. 5:362. 1857.—*Philibertia hartwegii* var. *heterophylla* Vail, Bull. Torr. Cl. 24:308. 1897.—*Philibertia heterophylla* Cockerell, Bot. Gaz. 26:279. 1898.—*Type locality*: Near Fort Yuma, Arizona.

Growing abundantly on the moist cultivated bottom-lands at Mulegé (3684) and draping the shrubbery with masses of

foliage and white flowers. The leaves become very large, some reaching 11 cm. in length and 35 mm. in width; the average measurements, however, are considerably smaller.

LXXII. CONVULVULACEÆ

313. *Cressa truxillensis* H.B.K.

Cressa truxillensis H.B.K., Nov. Gen. et Sp. 3:119. 1818.—*Cressa cretica* var. *truxillensis* Choisy in DC., Prodr. 9:440. 1845.—*Type locality*: Truxillo, Peru.

Seen on Sal si Puedes Island growing near the shore, on Raza Island (3209) growing on a silty flat used as a nesting site by gulls, and on Santa Inez Island (3655) along a cobblestone beach just above the high-tide line. This *Cressa* probably is represented by the two unrecognizable scraps that Vasey and Rose (Contr. U. S. Nat. Herb. 1:80. 1890) mention in their account of Isla Raza.

314. *Cuscuta americana* var. *congesta* (Benth.) Progel

Cuscuta americana var. *congesta* Progel in Martius, Fl. Brasil. 7:376. 1871.—*Cuscuta congesta* Benth., Bot. Sulph. 138. 1844.—*Type locality*: Acapulco, Guerrero.

Growing on low shrubs in a sandy wash at Guaymas (3117) where it has also been collected by Palmer and Brandegee.

315. *Cuscuta corymbosa* var. *stylosa* (Choisy) Engelm.

Cuscuta corymbosa var. *stylosa* Engelm., Trans. Acad. St. Louis 1:484. 1859.—*Cuscuta stylosa* Choisy, Mem. Soc. Phys. et Hist. Nat. Geneve 9:283, t. 5, f. 2. 1841.—*Type locality*: Mexico.

Growing in large tangled masses on *Vaseyanthus* and *Hofmeisteria* in the steep draws that cut the high seaward cliffs of Isla Partida (3222). A similar plant was growing upon *Bebbia* on Ceralbo Island (4070). The latter collection varies considerably in size of flower, ranging between 4 and 6 mm. in length, and may represent another species. *Cuscuta corymbosa*, or its varieties, has not previously been reported from the gulf area. It is readily distinguished from *C. patens* Benth. (Bot. Sulph. 35. 1844), the common coarse-stemmed,

large-flowered species of the cape region, by its narrower non-inbricate sepals. Bentham's description and discussion clearly show that *patens* is identical with *C. macrocephala* Schaffner (Yuncker, Univ. Ill. Biol. Monog. 6:126. 1919). Yuncker incorrectly lists *patens* in the synonymy of *C. corymbosa* var. *grandiflora*.

316. *Cuscuta leptantha* var. *palmeri* (Wats.) Yuncker

Cuscuta leptantha var. *palmeri* Yuncker, Univ. Ill. Biol. Monog. 6:136, f. 34f, 91. 1919.—*Cuscuta palmeri* Wats., Proc. Am. Acad. 24:64. 1889.—*Cuscuta polyanthemos* Schaffner in Yuncker, Univ. Ill. Biol. Monog. 6:136, f. 31, 92. 1919.—*Type locality*: On Euphorbia at Los Angeles Bay, Lower California.

Collected on species of Euphorbia at Las Animas Bay (3494) and San Nicolas Bay (3707). Two collections from La Paz and one from Los Angeles Bay also have been studied. All the collections examined, including the type of *C. palmeri*, and all collections seen and cited by Yuncker (l.c.), have uniformly four-parted flowers with lobes frequently recurved. The appendage developments characteristic of *C. leptantha* and *C. palmeri*, if ever distinct, at times certainly are indistinguishable, and so, if the latter is to be kept up, it must be on the grounds of its distinct range and the tendency for its corolla-lobes to reflex. It might be noted that, in the suite of specimens studied, *leptantha* seemed to have more slender flowers and to dry a darker color than *palmeri*. Both species and variety grow usually, if not invariably, on Euphorbia. *Cuscuta polyanthemos* seems to be merely a large-flowered phase of *palmeri*.

317. *Cuscuta umbellata* H.B.K.

Cuscuta umbellata H.B.K., Nov. Gen. et Sp. 3:95. 1818.—*Type locality*: Between Queretaro and Salamanca, Mexico.

Growing over Boerhaavia, Portulaca, and Amaranthus at Coyote Bay (4177), and primarily over Amaranthus at Marquer Bay on Carmen Island (3837). The material may be referable to Yuncker's variety *reflexa*, but it is very mature

and there is no certainty even of the specific determination. Brandegee has several collections from the cape region, and Palmer has one from Guaymas.

318. *Cuscuta veatchii* Brandg.

Cuscuta veatchii Brandg., Proc. Calif. Acad. Sci. II, 2:189. 1889.—*Type locality*: Ubi, Lower California.

Seen only at Los Angeles Bay (3430, 3439) where local infestations were frequent on trees of *Veatchia*. It is a very peculiar species, forming net-like growths that drape the uppermost branches of large trees. In one instance the parasite came within 15 dm. of the ground, but in all others it grew in a belt, well over 3 m. above the ground. Brandegee has remarked concerning the improbability of terrestrial seed germination and has suggested that probably the seeds germinate in the crotches of the branches. His hypothesis, however, does not allow for the infestation of new trees nor does it take account of the fact that the bark of the host is smooth and is annually exfoliated. The life history of this species presents an interesting subject for future observation and study. The species has been previously known only through Brandegee's three original collections from Ubi, San Enrique, and Santa Maria; all stations between 29° and 30° N. lat. The Academy collection comes from about 75 km. east southeast of Ubi, the most southern of Brandegee's localities.

Yuncker (Ill. Biol. Monog. 6:159. 1919) has referred to *C. veatchii* certain collections from San Diego County, California, and The Needles, Arizona. Even though the writer has not examined these specimens, he feels that the reference should be strongly questioned, for *C. veatchii* is so striking in its habit and so restricted to *Veatchia* where it has been seen by Mr. Brandegee or the author, that a reference of Californian material to it seems incongruous. It is also significant that Yuncker's *C. Veatchii* var. *apoda* apparently represents a specifically distinct unit most nearly related to *C. salina*. Three of the four collections that Yuncker refers to his variety *apoda* (loc. cit.) have been examined. These collections differ from *C. veatchii* in their larger flowers, subsessile anthers, longer acute (not rounded) corolla-lobes, and more elongate floral

appendages which reach just to, and not beyond, the point of staminal insertion. It is indeed strange that Yuncker should consider the Nevadan plants, which grow on *Atriplex* and other chenopods, as specifically identical with the Veatchia-infesting peninsular plant. The Nevadan plants referable to Yuncker's *C. veatchii* var. *apoda* should be dissociated from *C. veatchii* and called *Cuscuta nevadensis*, n. sp.

319. *Ipomœa aurea* Kell.

Ipomœa aurea Kell. in Curran, Bull. Calif. Acad. Sci. 1:143. 1885.—*Ancisia aurea* Kell., Proc. Calif. Acad. Sci. 5:83. 1873.—*Operculina aurea* House, Muhl. 5:68. 1909.—*Type locality*: San José del Cabo, Lower California.

A very beautiful vine that is frequent from Loreto southward. It climbs trees of *Lysiloma* which grow along gravelly washes, and produces its strikingly beautiful bright yellow flowers in abundance. In certain localities some flowers have ten magenta spots low in the tube, whereas other flowers are entirely yellow. The plant was seen at the following localities: Loreto (3779, 3795), Escondido Bay, Agua Verde Bay (3875), San Evaristo Bay, San Josef Island, Espiritu Santo Island, Ceralbo Island (4027), and La Paz.

320. *Ipomœa pes-capræ* (L.) Roth

Ipomœa pes-capræ Roth, Nov. Sp. Pl. 109. 1821.—*Convolvulus pes-capræ* L., Sp. Pl. 159. 1753.—*Type locality*: India.

This rankly growing, coarse plant creeps over the sand and forms broad patches on the beach at La Paz (3074) where it is known as "tripa de aura". Elsewhere it was seen only at San Nicolas Bay where a few small plants grew on the dunes. This latter station, about 26° 30' N. lat., is the northernmost recorded station on the Pacific shore of North America. The plant is reported as common on the beaches south of La Paz.

321. *Jacquemontia eastwoodiana*, n. sp.

Perennial, shrubby near the base, canescent with a dense close tomentum; stems 6-9 dm. long with short (1 dm. or less) laterals, usually non-twining; leaves orbicular-ovate to oblong-

ovate, base cordate, tip mucronate, blade 1-2 or rarely 3 cm. long, 10-18 or rarely 25 mm. wide; petioles 2-4 or at times 8 mm. long; peduncles cymosely 1-3-flowered, upper ones 1-3 cm. long, lower at times 5-6 cm. long; bracts subulate, deciduous, 1-4 mm. long, inconspicuous; pedicels 1-3 mm. long; sepals very unequal; outer sepals broadly ovate, short-acuminate, 6-9 mm. long, 5-6 mm. broad; corolla bright blue, funnel-form, 12-15 mm. long, limb 12-16 mm. broad; capsule ovate or orbicular-ovate, 4-5 mm. long, the 4 valves divided; seeds black, closely and minutely papillate, 2-2.5 mm. long.

Type: No. 1296, Herb. Calif. Acad. Sci., collected May 17, 1921, by I. M. Johnston (no. 3742) on the summit of **Ildefonso Island, Gulf of California.**

Collected on Tortuga (3591) and Ildefonso (3742) islands, and at Mulegé (3662) and San Nicolas Bay (3722). What is no doubt the same was seen on all the large islands from Carmen Island southward. The plant is quite variable as to habit, for it is either a small bush 4-5 dm. high covered with lax branches, or it trails and occasionally twines through large shrubs, or, as on Ildefonso Island, forms large prostrate mats. It is a pretty and very attractive plant when covered with its myriads of small bright blue flowers.

The nearest relative of *J. eastwoodiana* is *J. abutiloides* Benth. (Bot. Sulph. 34. 1844), but it differs from the latter species in its denser pubescence, smaller and shorter petioled leaves, shorter branches, fewer (1-3 instead of 3-5 flowered and shorter peduncles, smaller flowers, broader sepals with short (not prolonged) acuminate tips, and shorter deciduous inconspicuous bracts. *Jacquemontia abutiloides* ranges over the western part of the cape region extending from Magdalena Bay, the type locality, southward to San José del Cabo. On the other hand, *J. eastwoodiana* ranges from San José del Cabo northward, primarily along the gulf shore, to at least Calmalli (*Purpus* 205) and Tortuga Island. The notes on *Jacquemontia* given by Goldman (Contr. U. S. Nat. Herb. 16:361. 1916) probably refer partially to the new species, but those by Brandegee (*Zoe* 2:148. 1891) are based entirely upon *J. abutiloides*.

This new species is named in honor of Miss Alice Eastwood, curator department of botany, California Academy of Sciences.

LXXIII. POLEMONIACEÆ

322. *Gilia palmeri* Wats.

Gilia palmeri Wats., Proc. Am. Acad. 24:61. 1889.—*Type locality*: Near Los Angeles Bay, Lower California.

Found in a condition fit for collecting only at San Luis Gonzales Bay (3327) where it was very common on the broad sandy plain that heads the bay. It was noted as frequent over the higher parts of San Luis Island, as infrequent on Angel de la Guarda Island, but as extremely abundant on Pond Island where, at the time of our visit, the dried plants gave a straw-color to many slopes. A few dried plants were seen at Los Angeles Bay. Watson gives the color of the corolla as violet, but on all the plants seen by me the corollas were pink and the anthers bluish. The plant, which is very open in its growth, is branched from the base with many widely ascending laterals, and usually grows 3-6 dm. high. The base of the stem is woody and the root is persistent. Vasey and Rose (Proc. U. S. Nat. Mus. 11:536. 1890) give similar observations based on specimens from back of Lagoon Head.

LXXIV. HYDROPHYLLACEÆ

323. *Nama coulteri* Gray

Nama coulteri Gray, Proc. Am. Acad. 8:283. 1870.—*Nama hispidum* var. *coulteri* Brand Pflanzenr. 4²⁶¹:154. 1913.—*Type locality*: "California", perhaps Lower California.

A few specimens of this *Nama* were taken from the edge of a cornfield that bordered on the tule-lined reservoir in the cultivated bottoms at Mulegé (3674). The plant appears to be frequent over the southern two-thirds of the peninsula, for it has been collected at Santa Agueda (*Palmer 240*), Magdalena Bay (*Lung*), San Gregorio (*Brandegge*), La Paz (*Brandegge*), and San José del Cabo (*Anthony 348, Brandegge*). This peninsular plant has been confused with *N. demissum* Gray, even by Brand (op. cit. 159) who cites under that name the Brandegge collections just mentioned. The Santa Agueda collection of Palmer was distributed as *N. hispidum*, but reported as *N. demissum* (Contr. U. S. Nat. Herb. 1:85. 1890). *Nama coulteri* and its near relative *N. hispidum* are

readily distinguished from all forms of *N. demissum* by the shape of the leaves, insertion of the stamens, and polysperous capsules.

The closest relatives of *N. coulteri* are those broad-leaved plants which Brand referred to *N. hispidum* var. *mentzelii* and *N. hispidum* var. *coulteri*. From *N. hispidum* var. *mentzelii* Brand, which properly includes the broad-leaved form of *hispidum* usually called *coulteri*, true *coulteri* differs in its more diffuse habit, very slender, sparsely pubescent, loosely branched stems, usually shorter, and proportionately broader, thinner leaves, looser, few-flowered inflorescence, and filiform not flattened filaments. Typical *N. hispidum*, as exemplified by the type series of specimens, is the slender, usually erect-growing plant with small narrow linear leaves which is most common in western Texas.

It is a remarkable fact that this seemingly endemic peninsular species is exactly represented in the type of *Nama coulteri*. Its presence in Coulter's collections suggests that he may have visited some of the ports of Lower California and that others of his collections labeled "California" may also have come from the peninsula.

324. *Phacelia scariosa* Brandg.

Phacelia scariosa Brandg., Proc. Calif. Acad. Sci. II, 2:185. 1889.—*Type locality*: Magdalena Island.

Two collections of this species were made, both on gravelly floors of cañons in the Sierra Giganta; one from back of Escondido Bay (4111), and the other from near Agua Verde Bay (3884). The specimens closely match the type.

LXXV. BORAGINACEÆ

325. *Bourreria sonora* Wats.

Bourreria sonora Wats., Proc. Am. Acad. 24:62. 1889.—*Type locality*: Mountains about Guaymas, Sonora.

Frequent over the southern and eastern parts of the peninsula, and on the adjacent islands. Due to the unfavorable season at the time of our visit, the plant was collected only at La Paz (3051), Carmen Island (3813), and Ceralbo Island

(4060), but the unmistakable herbage and habit were recognized at San Carlos, San Pedro, San Nicolas, Agua Verde, Escondido, and San Evaristo bays; at Guadalupe Point, and Loreto; and on Monserrate, Danzante, San Diego, Santa Cruz, San Josef, San Francisco, and Espiritu Santo islands. It was nowhere abundant, usually occurring sparingly in gravelly washes intermixed with *Lysiloma* or less frequently on rocky hillsides with *Fouquieria* and *Bursera*. It is a weak, open, erect-growing irregular shrub 1-3 m. high. On Carmen Island it was much browsed by cattle.

326. *Coldenia canescens* var. *subnuda*, n. var.

Nutlets nude or merely pubescent towards the apex, not long silky over most of the back.

Type: No. 1297, Herb. Calif. Acad. Sci., collected May 16, 1921, by I. M. Johnston (no. 3731) on a stony bench at **San Nicolas Bay, Lower California.**

Common on rocky mesas at San Nicolas Bay (3731) where it forms flat-topped, shrubby growths 15-25 cm. high and 3-5 dm. broad. Also locally common on the benches that top the sea-cliffs at Marquer Bay on Carmen Island (3839). The only other collections from the region are those made by Brandegee at San Gregorio and Calamajuet. The plant has probably migrated into the peninsula from extreme southern California into which it has come from Arizona and New Mexico. The variety here proposed includes those forms of *canescens* that occur in southwestern United States and Lower California, and which differ from the plants of eastern Mexico in their nude or merely slightly pubescent (not densely long silky) nutlets.

327. *Coldenia cuspidata* n. sp.

A dichotomous perennial, forming matted growths 1-4 dm. broad, usually closely prostrate but occasionally depressed bushy and 1-2 dm. high; stem shrubby, young branches brittle, white with a dense villous-tomentum, the tomentose bark peeling off, leaving older stems with a rough exfoliating brown papery bark; leaves crowded in flat fascicles; leaf-blade ovate to lance-ovate, cuspidate-acute, 2-6 mm. long, 1-4 mm. wide,

margins entire and strongly revolute, hirsute, mid-rib pronounced, veins few and faint; petioles triangular, dilated towards the base, 1-2 mm. long, densely white villous; flowers axillary, rather few; calyx sessile, crowded in among the leaves and hard to distinguish from them, densely villous-hirsute; sepals oblanceolate, obtuse or acutish, about 2 mm. long, joined by a membrane for over half their length and thereby forming a tube, sinuses rounded or even square, lobes occasionally unequal; corolla pale bluish, salverform, 3-4 mm. long, tube 2.5-3 mm. long and exceeding the calyx, lobes imbricate and half again as wide as long, unappendaged; stamens unequal, insertion slightly unequal and usually 0.9-1.1 mm. above the base of the corolla-tube; filaments linear-filiform, practically undilated; anthers with the oblong cells deeply grooved and therefore appearing as if 4-celled; pistil 2.5-3.5 mm. long; style 2-parted, lobes 0.8-3 mm. long; ovules 2, usually one aborted; nutlets adnate to style for about 4/5 of former's length, dark brown, about 1-1.3 mm. long, oblong-ovate or globose, surface covered with fine close-set lineately-arranged granulations, when solitary the ventral face somewhat flattened and bearing the elevated oblong pallid basal remnant of the style, when both ovules develop the ventrally flattened nutlets detaching from the cuneate gynobase by a low-placed circular scar.

Type: No. 1298, Herb. Calif. Acad. Sci., collected May 12, 1921, by I. M. Johnston (no. 3617) in gypsum soil on **San Marcos Island, Gulf of California.**

Collections of this species were made on San Marcos Island (3617), and at Loreto (3778), Mulegé (3678), and San Nicolas Bay (3712). It usually grows in sandy or gravelly places, commonly in washes, but about the type locality it grows on talus footing gypsum cliffs. It is not a new discovery, for Palmer collected it in 1889 at Santa Rosalia (195), and soon after Brandege found it near Magdalena Bay. The plant appears to range over the southern middle segment of the peninsula. According to field notes, the San Marcos plants have "very faded bluish", and the Mulegé plants "pale rose-color" corollas. Palmer (Contr. U. S. Nat. Herb. 1:85. 1890) notes that the Santa Rosalia plants have "rose-colored" flowers.

The proposed new species unquestionably belongs to Gray's section Eddya, and among North American species is nearest to *C. hispidissima*. *Coldenia cuspidata*, however, can be distinguished at once from its relative by its 2 ovules, smaller and more finely marked nutlets, smaller corollas, differently shaped leaves, united sepals, and undilated filaments. Not only is *cuspidata* morphologically distinct, but it is separated from the nearest stations of *hispidissima* by half the length of the peninsula, by the gulf, and by all of Sonora. The peninsular form is certainly distinct, but why it has remained so long unpublished is puzzling. Perhaps this is due to the small size and foliage-simulating nature of the calyx; a fact which might cause fruiting specimens to be passed by as sterile.

Coldenia cuspidata appears to have its closest relative in *C. darwini* of the Galapagos Islands, but is readily separated from that species by its united calyx-lobes, larger nutlets, and smaller corollas. The northern plant is also notable because of its two ovules. As pointed out in the study on South American *Coldenias* (Contr. Gray Herb. 70:58. 1924), *C. dichotoma* and *C. grandiflora* regularly mature only two nutlets, but this is due to the regular abortion of two of the four ovules developed. *Coldenia cuspidata* produces only two ovules. The relationship of *C. cuspidata* to the other North American species may be appreciated by a study of the following natural key.

Nutlets not distinct in situ, when all developed the flattened inner faces closely appressed against one another to form a lobed or unlobed fruit. (Stegnocarpus, Ptilocalyx, Lobophyllum) §EUCOLDENIA DC.

Inflorescence capitate; only one nutlet developing; sepals subulate; a low bushy shrub *C. greggi* (Torr.) Gray

Inflorescence axillary; 4 nutlets commonly developing; sepals narrowly lanceolate; prostrate shrubby plant.

Nutlets densely villous on back..... *C. canescens* DC.

Nutlets sparsely if at all villous..... *C. c. subnuda* Johnston

- Nutlets distinct in situ, without flattened proximate inner faces, the fruit 4-parted when all nutlets develop.
- Corolla-appendages present; petioles long, never villous; leaf blade with evident impressed veining above. §TIQUILIOPSIS Gray.
- Annuals; corolla pink or white; sepals with pungent bristles, not densely villous; style surpassed by calyx; cotyledons horseshoe-shaped. *C. nuttallii* Hook
- Perennials; corolla bluish; sepals villous; style exceeding calyx; cotyledons suborbicular or ovate, at most nicked and never horseshoe-shaped.
- Leaves with about 6 pairs of deeply impressed veins; corolla 4.5 mm. long, with weakly developed appendages; cotyledons oblong; nutlets oblong-ovate, cuneate in transverse cross-section, usually black, smooth and shiny. *C. plicata* (Torr.) Cov.
- Leaves with only 3 or 4 shallowly impressed veins; corollas 4.5-6 mm. long, with well developed appendages; cotyledons orbicular; nutlets nearly spherical, brown or plumbeous, usually granulate and dull *C. palmeri* Gray
- Corolla-appendages wanting; petioles short or long, frequently villous; leaf blades usually without evident impressed veining. (Galapagoa, Eddyia) §EDDYA Gray.
- Ovules 2; sepals joined for about half their length; nutlets granulate; leaves cuspidate *C. cuspidata* Johnston
- Ovules 4; sepals distinct; nutlets coarsely papillose; leaves not cuspidate.
- Petioles triangular, indurated.
- Blade 1-1.5 mm. wide, narrower than petiole; Tex., N. M., and n. e. Mex. *C. hispidissima* (Torr.) Gray
- Blade 1.5-3 mm. wide, twice width of petiole; Nev. to Utah and Ariz. *C. h. latior* Johnston

Petioles linear, herbaceous.

Petiole short, a third or less the length of blade; leaves crowded.....*C. tomentosa* Wats.

Petiole long, half longer than blade; leaves not crowded.

Plant canescent, more or less tomentose; petioles sparsely if at all villous-ciliate; leaves orbicular-ovate or ovate, veining obscure; sepals villous-tomentose*C. mexicana* Wats.

Plant green, sparsely long appressed hispid; petioles with a dense conspicuous villous-ciliation; leaves lance-ovate, acute, veining evident; sepals hispid*C. purpusii* Brandg.

328. *Coldenia palmeri* Gray

Coldenia palmeri Gray, Proc. Am. Acad. 8:292. 1870.—
Triquiliopsis palmeri Rydb., Fl. Rocky Mts. 711. 1917.—
Coldenia angelica Wats., Proc. Am. Acad. 24:62. 1889.—
Coldenia brevicalyx Wats., Proc. Am. Acad. 24:62. 1889.—
Type locality: "Lower Colorado River", probably from extreme western Arizona.

Collected at San Luis Gonzales Bay (3343), Angel de la Guarda Island (4210), Los Angeles Bay (3426), San Francisco Bay (3571), Tiburon Island (4248), and Kino Point (4287). Apparently the only other Mexican collections of this species are Palmer's from Los Angeles Bay (type collection of *C. angelica*), and Brandegees from Calamujet. At Kino Point and on Tiburon Island the plant grew in the dunes along the ocean, but usually it grew in sandy washes or on the alluvial plains back from the shore. It forms a shrubby subprostrate mat-like growth 1-2 dm. high and 3-9 dm. broad. It appears to be perennial, the stems becoming very woody and attaining 3-8 mm. diameter. A stem 4 mm. thick had nine growth rings. With such desert plants, however, it is difficult to say whether or not it is perennial or merely a long-lived annual that has grown more or less continuously throughout the year. The flowers are a faded light-blue or almost purple, and remain closed until after the middle of the forenoon.

It should be noted that in the present paper the name "*Coldenia palmeri*" is not used in the current sense, but is applied to that concept which has almost universally been called *C. brevicalyx*. This new usage has resulted from a study of the sheet which is the dual type of *C. palmeri* Gray, and *C. brevicalyx* Wats. The sheet mentioned consists of a single mounted plant and a large pocket containing some scraps. With the exception of a small twig in the pocket (hardly 1% of the total material) the plant represented is clearly that current under the name of *C. brevicalyx*. The small twig in the pocket is the plant usually called *C. palmeri*. Gray apparently never distinguished between the species which Watson called *C. brevicalyx* and *C. palmeri*. Watson, after a study of Gray's type of *Coldenia palmeri*, limited the name *C. palmeri* "to the one of Palmer's original specimens which has the leaves plicate-lineate by about 6 pairs of straight and strong veins", or in other words to the tiny scrap in the attached pocket. He then proceeded to describe the remaining material as *C. brevicalyx*. Watson's interpretation of *C. palmeri* is unjustifiable. Gray naturally would, and evidently did, consider the mass of the material in the Palmer collection as typical of his *C. palmeri*, for it was the atypical scrap in the pocket that was the basis of his supplementary statement that the leaf-surface in the younger specimens was "strongly and beautifully plicate". In comparing his species with *C. fusca* and *C. nuttallii*, and in citing Watson's King's Expedition specimen (which is typical *C. nuttallii*), Gray further showed that in his mind the name *C. palmeri* was coupled with the plant which had shallowly and remotely nerved leaves, and which simulates *C. nuttallii* and *C. fusca*, or in other words with the major portion of Palmer's specimen and that called *C. brevicalyx* by Watson. There seems no other recourse, therefore, than to consider *C. brevicalyx* Wats. as synonymous with *C. palmeri* Gray. The plant with conspicuous plicate nerves and that which has been usually called *C. palmeri* should be called *C. plicata* Cov. *Coldenia brevicalyx* is supposed to have smaller flowering parts than *C. angelica*, but as these developments are not geographically correlated the recognition of the two species is

inadvisable, especially as material from Los Angeles Bay (type locality of *C. angelica*) is indistinguishable from typical *brevicalyx*. *Coldenia angelica* has priority of position over *C. brevicalyx*.

329. *Coldenia plicata* (Torr.) Cov.

Coldenia plicata Cov., Contr. U. S. Nat. Herb. 4:163. 1893. *Coldenia brevifolia* var. *plicata* Torr., Bot. Mex. Bound. 136. 1859.—*Coldenia palmeri* of Wats. and recent authors, not of Gray.—*Type locality*: Colorado Desert, California.

Frequent on the dunes at Tepoca Bay (4407). Quickly recognized by its deeply veined, densely pubescent leaves.

330. *Cordia brevispicata* M. & G.

Cordia brevispicata M. & G., Bull. Acad. Brux. 11²:331. 1844.—*Cordia palmeri* Wats., Proc. Am. Acad. 24:62. 1889.—*Cordia sacorcncensis* Brandg., Erythea 7:5. 1899.—*Type locality*: Tehuacan, Puebla.

Collected at San Carlos (4364), San Pedro (4319), and Agua Verde (3873) bays, and on Espiritu Santo (3967, 4075), and Ceralbo (4049) islands. Usually only a few plants were seen at each locality, but at San Carlos Bay and at Candeleros Bay on Espiritu Santo Island the plant was rather frequent. It appears to affect gravelly situations, usually occurring in cañons and particularly about large rocks. It has exceedingly numerous, strictly ascending stems which form a dense domed growth 1-2 m. high. The plant has a peculiar odor which suggests that of the drug, coltsfoot. The corolla is creamy yellow and has more or less recurved lobes. The species is not frequent over the southern portions of the peninsula but ranges as far north as San Pablo where Purpus collected it in 1898.

331. *Cryptantha angelica* n. sp.

A rather dense depressed rounded plant 15-25 cm. high; stems spreading, branched from the base with numerous re-branched laterals, brown and glabrous below, canescent and strigose above; leaves linear, 8-24 mm. long, 1-2 mm. wide,

conduplicate, strigose and densely pustulate below, very sparsely strigose and sparingly pustulate above, not particularly numerous; inflorescence of numerous biserial unilateral naked very floriferous spicate-racemes that occur in groups of 1-3 on short peduncles nearly throughout the plant; corolla white, very inconspicuous, about 1 mm. long, lobes about 0.25 mm. long, tube shorter than sepals; fruiting calyx about 2 mm. long, strictly ascending, sessile or on pedicels 0.5 mm. long, lobes linear-lanceolate ribbed and conspicuously hirsute, axial lobe the shortest the least pubescent and least evidently ribbed; nutlets 4, heteromorphous with the nutlet adjacent the abaxial sepal the largest and most persistent, all nutlets narrowly ovate, sharp-margined and dark with pallid tubercles, odd nutlet (about 0.7 mm. long) exceeding the gynobase by 0.2 mm., homomorphous nutlets (about 0.6 mm. long) exceeding gynobase by 0.1 mm.; style about 0.5 mm. long, exceeding odd nutlet by about 0.4 mm.; groove of nutlets usually closed above but lower third usually dilated to form a shallow triangular areola.

Type: No. 1299, Herb. Calif. Acad. Sci., collected June 30, 1921, by I. M. Johnston (no. 4221) on a silty flat near the south end of **Angel de la Guarda, Gulf of California.**

A few plants of this species were collected on a silty flat on Angel de la Guarda Island (4221) at a point just opposite Pond Island. The relations of the plant are with *C. inaquata*, but this plant differs from that species in its denser inflorescence and much smaller calyces and nutlets. The related species, those with sharp or beveled or wing-edged nutlets, may be distinguished by the following key:

- Nutlets inconspicuously roughened, plano-convex in cross-section, face flat, back rounded. (*C. seorsa* Macbr.).....*C. costata* Brandg.
- Nutlets conspicuously roughened, not plano-convex in cross-section.
 - Calyx evidently pedicelled; long-lived annuals.
 - Nutlets homomorphous; calyx persistent.....*C. holoptera* Gray
 - Nutlets heteromorphous; calyx deciduous*C. racemosa* (Wats.) Greene

Calyx sessile or subsessile; short-lived annuals.

Style exceeding the nutlets.

Nutlets heteromorphous; calyx moderately broad.

Inflorescence dense; fruiting calyx about 2 mm. long; nutlets 0.6-0.7 mm. long.....

C. angelica Johnston

Inflorescence loose; fruiting calyx 2.5-3.0 mm. long; nutlets 1.7 mm. long.....

C. inequata Johnston

Nutlets homomorphous; calyx very broad...*C. pusilla* (T.&G.) Greene
Style shorter than nutlets.

Nutlets 4-3, usually broadly winged...*C. pterocarya* (Torr.) Greene

Nutlets 1-2, narrowly winged..... *C. utahensis* (Gray) Greene

332. *Cryptantha angustifolia* (Torr.) Greene

Cryptantha angustifolia Greene, Pitt. 1:112. 1887.—*Eri-trichium angustifolium* Torr., Pacif. R. R. Rep. 5:363. 1856.—*Krynitzkia angustifolia* Gray, Proc. Am. Acad. 20:272. 1885.—*Type locality*: Fort Yuma, Arizona.

Collected on Tiburon (4390), San Luis (4391), and Angel de la Guarda (4227) islands. What was probably the same was noticed on the dunes at Tepoca Bay. Known on the peninsula only through collections of Palmer, who collected it at Los Angeles Bay (606) and at Santa Agueda (241).

333. *Cryptantha grayi* var. *cryptochæta* (Macbride), n. comb.

Cryptantha micromeres var. *cryptochæta* Macbride, Contr. Gray Herb. II, 48:46. 1916.—*Cryptantha filiformifolia* Macbride, Contr. Gray Herb. II, 48:45. 1916.—*Type locality*: San José del Cabo, Lower California.

Collections representing this small-flowered southern form of *C. grayi* were made on a sandy clearing at La Paz (3055, 3071). *Cryptantha grayi* (Vasey & Rose) Macbride (op. cit. 43) is a well-marked species related to *C. angustifolia* and to *C. micromeres*, but readily distinguished from each by its homomorphous nutlets and southern range. In having the style much exceeding the nutlets it agrees with *C. angustifolia* but differs from *C. micromeres*, for the latter plant has the style and largest nutlet subequal. Macbride has described sev-

eral forms in this group apparently because he confused *C. micromeres* and *C. grayi*. One of his names, however, can be used to designate the small-flowered plant that replaces the large-flowered typical form in the cape region of the peninsula.

334. *Cryptantha grayi* var. *nesiotica*, n. var.

Nutlets etuberculate or with only a few pallid tubercules, surface usually wrinkled and unicolored; stems stouter and more or less densely villous-strigose.

Type: No. 1300, Herb. Calif. Acad. Sci., collected May 30, 1921, by I. M. Johnston (no. 3947) on the dunes on **San Francisco Island, Gulf of California**.

This is a frequent plant on the dunes on Coronados (3947), San Francisco (3766), and Espiritu Santo (3994) islands. It represents a small-flowered insular development of the species characterized by its coarser, villous-strigose stems and by its etuberculate nutlets. The root frequently contains a purple dye which stains the collecting papers.

335. *Cryptantha maritima* Greene

Cryptantha maritima Greene, Pitt. 1:117. 1887.—*Krynitzkia maritima* Greene, Bull. Calif. Acad. Sci. 1:204. 1885.—*Krynitzkia ramosissima* of Greene, Bull. Calif. Acad. Sci. 1:203. Aug. 1885. not Gray Jan. 1885.—*Type locality*: Guadalupe Island off west coast of Lower California.

Common on a silty flat on Angel de la Guarda Island (4237). Rare on the sandy plain at San Francisquito Bay (4394). A very common plant on the western part of the peninsula and on the islands off that shore. On the gulf side it appears to be largely replaced by the following variety:

336. *Cryptantha maritima* var. *pilosa* Johnston

Cryptantha maritima var. *pilosa* Johnston, Univ. Calif. Pub. Bot. 7:445. 1922.—*Type locality*: About Los Angeles Bay, Lower California.

On San Luis Island (4392) this is frequent in sheltered places, particularly among rocks. It was seen at no other point. The only peninsular material seen is that collected by Palmer

at Los Angeles Bay (551) and at Santa Agueda (242). The Santa Agueda collection is a mixture, for the Gray Herbarium material was correctly determined by Macbride (Contr. Gray Herb. II, 56:58. 1918) as *C. echinosepala*, whereas the material in the University of California herbarium is clearly the pilose form of *C. maritima*. *Cryptantha echinosepala* Macbride is a very distinct peninsular species which is most closely related to *C. angustifolia*, but which is readily distinguished from the latter by its commonly reddish stems, shorter style, and by its peculiar calyx whose axial (instead of abaxial) lobe is the longest and most hispid. At present *C. echinosepala* is known only from about Magdalena Bay, La Paz, and Santa Agueda.

337. *Cryptantha racemosa* (Wats.) Greene

Cryptantha racemosa Greene, Pittonia 1:115. 1887.—*Eritrichium racemosum* Wats. in Gray, Proc. Am. Acad. 17:226. 1882.—*Krynitzkia racemosa* Greene, Bull. Calif. Acad. Sci. 1:208. 1885.—*Krynitzkia ramosissima* Gray, Proc. Am. Acad. 20:277. 1884.—*Cryptantha suffruticosa* Piper, Proc. Biol. Soc. Wash. 32:42. 1919.—*Type locality*: Mesquite Cañon near Mesquite Station, Imperial County, California.

Collected at Las Animas Bay (3505), and on Angel de la Guarda (3374, 4204), San Esteban (3171, 3175), Tiburon (4255), South San Lorenzo (4192), and San Marcos (3621) islands. On the gulf islands known otherwise only from Carmen Island (Contr. U. S. Nat. Herb. 1:133. 1892). The plant affects rocky ground, usually growing on cañon sides. It varies much in habit of growth, having a single, subsimple, stiffly erect stem, or several widely spreading branches that produce many long, strict, subsimple branches, or one or two repeatedly and loosely branched bushy stems. The growth is usually irregular and the appearance decidedly unkempt. It is commonly 3-6 dm. high, but occasionally the virgate branches become close to a meter in length. The collections are very constant and check closely with typical material. The only notable atypical development is that in number 4204 where the calyces are almost bare of spreading hirsute bristles.

This species is usually said to be perennial, but observations do not bear out that statement. It seems probable that it is merely a persistent annual that flowers continuously throughout the year and becomes more or less suffruticose. No plants were seen that produced shoots from the year-old indurated base. It is a notable fact that dead wood is conspicuously rare even in large thriving plants of *C. racemosa*, close observation showing that all growth on the plant is less than a year old and that when part dies all usually dies. The condition in *C. holoptera* is probably the same. If the persistence of these two species is to be emphasized it is best stated by terming them "long-lived" annuals. The more evanescent species, which form the bulk of the genus *Cryptantha*, may be termed "short-lived" annuals.

338. *Heliotropium inundatum* Swartz

Heliotropium inundatum Swartz, Prodr. Veg. Ind. Occ. 40. 1788.—*Type locality*: West Indies.

Collected in an empty tinaja in the mountains back of Agua Verde Bay (3883) and in moist sand near a spring in the hills back of San Pedro Bay (4327).

LXXVI. LABIATÆ

339. *Hyptis emoryi* Torr.

Hyptis emoryi Torr., Bot. Ives Rep. 20. 1860.—*Mesosphærum emoryi* Kuntze, Rev. Gen. Pl. 2:526. 1891.—*Type locality*: "Upper Colorado" River, Arizona.

Referred to this species are the collections from Tepoca Bay (3304), Tiburon Island (3257, 4253), San Esteban Island (3165), and South San Lorenzo Island (3539). These specimens all agree in having the foliage about 2 cm. long, ovate, and densely tomentose. They are much more tomentose than are average specimens from Arizona and California. The plant usually grows on gravelly cañon floors and is a strictly though openly branched upright shrub 15-25 dm. high. *Hyptis emoryi* is very close to *H. albida* H.B.K., of which it is perhaps only a form.

340. *Hyptis emoryi* var. *amplifolia*, n. var.

Leaves ample, blade becoming 85 mm. long and 35 mm. wide, green above and frequently green also below.

Type: No. 1301, Herb. Calif. Acad. Sci., collected May 24, 1921, by I. M. Johnston (no. 3852) in a wash at Escondido Bay, Lower California.

Of this variety only a single collection was made, and that the type. The plant was very common on the diluvial plain at the foot of the Sierra Giganta back of Escondido Bay. It formed an erect-growing open shrub nearly 3 m. high. It is apparently common over the southern portions of the peninsula and includes the plants referred to *M. palmeri* by Goldman (Contr. U. S. Nat. Herb. 16:363. 1916). It differs from *palmeri* in range and in its larger leaves. Some plants of *amplifolia* have the leaves glabrous on both surfaces, but in others, as the type specimen, they are closely tomentose beneath. Two sheets collected by Brandegee at Magdalena Bay and on Margarita Island are referred to *amplifolia* with doubt. The specimens are more woody, and due to the excessively woolly calyces and long peduncles, have an inflorescence very similar to that in *H. laniflora*.

341. *Hyptis emoryi* var. *palmeri* (Wats.), n. comb.

Hyptis palmeri Wats., Proc. Am. Acad. 24:68. 1889.—*Mesosphærum palmeri* Goldman, Contr. U. S. Nat. Herb. 16:363. 1916.—*Type locality*: Arroyos about Guaymas, Sonora.

To this variety, which is a very poor one, are referred the collections from Guaymas (3101) and Angel de la Guarda Island (3359, 3401). Also referable to it are Palmer's collections at Guaymas (278), and Los Angeles Bay (573), and Brandegee's from Guaymas. The type collection, which is more luxuriant than other collections from about Guaymas, probably came from a sheltered place and so is not typical of the common plant about the type locality. As here interpreted, *palmeri* is the form of *emoryi* with leaves commonly 2-3 cm. long, frequently deltoid-ovate, and usually bicolored with the

upper surface green and the lower face usually pallid with a close tomentum. Some plants are at first tomentose and later become glabrate.

342. *Hyptis laniflora* var. *insularis* (Standley & Goldman), n. comb.

Mesosphaerum insulare Standley & Goldman, Contr. U. S. Nat. Herb. 13:375. 1911.—*Type locality*: Espiritu Santo Island.

This form is frequent in the gravelly washes on Espiritu Santo (4072) and Ceralbo (4030, 4040) islands. It forms a loose shrub 10-25 dm. high. The original description gives the height as 3-6 m., but these measurements must be incorrect, for, though many plants were seen at the type locality and elsewhere, none even approached that height. At Ruffo's Ranch on Ceralbo Island the plant was browsed down to a compact twiggy mass about a meter high.

The insular plants are frosty white with a close tomentum. This departure from the green and glabrous condition, typical of the species in its strict sense, is here treated as the variety *insularis*. Standley and Goldman emphasize the leaf-shape as the crucial character, but plants with obtuse or rounded or retuse leaves come even from San José del Cabo, the probable type locality of *H. laniflora*. Sinuate and entire leaf-margins also occur on the peninsular material. Furthermore, the insular plants appear to go through the same gamut of variation in leaf-shape as does the material from the peninsula. It is evident that leaf-shape can not be used as a diagnostic character, and so the geographically linked variation is better as the variety *insularis*.

343. *Salvia californica* Brandg.

Salvia californica Brandg., Proc. Calif. Acad. Sci. II, 2:197. 1889.—*Type locality*: Calmali, Lower California.

Locally very abundant in a broad sandy draw at Los Angeles Bay (3428). It is a shrub 10-15 dm. high with very numerous tufted stems and an extremely large amount of dead wood. The dense, almost solid, mass of tufted stems is not infrequently over 6 dm. broad at the base. The corolla is blue with an

oblong yellow mark on the lower lip. Although the habit and peculiar foliage make the plant very interesting, it is nevertheless utterly lacking in æsthetic qualities. The collection at Los Angeles Bay extends the known range of the species. Since its discovery in 1889 the plant has been known only from the two stations, Calmalli and Cordon Grande, given by Brandegee under the original description. Goldman (Contr. U. S. Nat. Herb. 16:363. 1916) reports it from near San Pablo, but that is essentially the same as Cordon Grande. The new station is about 100 km. north of Calmalli. The range of the species is therefore that part of the peninsula between 28° and 29° N. lat. The four known collections are remarkably constant in characters.

344. *Salvia platycheila* Gray

Salvia platycheila Gray, Proc. Am. Acad. 8:292. 1870.—
Type locality: Carmen Island.

This species is quite common in a narrow cañon back of Puerto Ballandra on Carmen Island (3810) where it forms an open, erectly branched shrub 1-2 m. high. The plant is usually scraggly and asymmetrical, and grows in crevices in steep gulches or on talus footing cliffs. Previously the species has been known only from collections made on Carmen Island by Palmer (Contr. U. S. Nat. Herb. 1:133. 1892). Its occurrence can now be reported on Santa Cruz Island (3920) where it is common in rock crevices in rocky cañons and becomes 2 m. high. Both collections are sterile, but are identical in vegetative characters.

LXXVII. VERBENACEÆ

345. *Avicennia nitida* Jacq.

Avicennia nitida Jacq., Enum. Pl. Carib. 25. 1760.—*Type locality*: Isle of Martinique.

Noted at San Carlos Bay, Tepoca Bay (3288), Guadalupe Point Coyote Bay, Coronados Island (3758), Carmen Island (3821), Escondido Bay (4393), Danzante Island, San Evaristo Bay (4089), San Josef Island, Espiritu Santo Island, and La Paz (3045). Brandegee has collections from Guaymas,

La Paz, and Magdalena Bay. The northernmost known station for the Pacific coast of North America seems to be Tepoca Bay in almost 30° N. lat.

The tree is frequent along the southern coast of the peninsula and is usually associated with *Rhizophora* and *Laguncularia*. It differs from *Rhizophora* in its selection of habitat, growing usually on the saline tide-flats or on the less deeply submerged land close to the high-tide line, and on the shore just back of the *Rhizophora*-thickets. Usually it is an upright shrub 25-30 dm. high, but at times it becomes a widely branched tree nearly 75 dm. in height. The flowers are creamy-yellow and very pleasantly fragrant. The foliage of *Avicennia* is frequently covered with a layer of salt. Although many insects are attracted to the flowers the entomologist found that beating yielded more salt-flakes than insects. At La Paz and on Carmen Island the plant was pointed out as "mangle."

346. *Citharexylum flabellifolium* Wats.

Citharexylum flabellifolium Wats., Proc. Am. Acad. 24:67. 1889.—*Type locality*: Ravines about Guaymas, Sonora.

Locally frequent in the gulches and about the summits of the bluffs along the ocean at Marquer Bay on Carmen Island (3840). An intricately though openly branched shrub 1-2 m. high with coarse, short, more or less spinescent branches. The fruit is black and somewhat baccate. On the peninsula it has been collected only at Comondú.

347. *Lippia palmeri* Wats.

Lippia palmeri Wats., Proc. Am. Acad. 24:67. 1889.—*Type locality*: Arroyos about Guaymas, Sonora.

This is a frequent plant about Willards Point (4267) and along the southeast shore on Tiburon Island. It is a characteristic shrub on rocky benches and on the drier, lower slopes of the hills, and forms a rounded bushy mass of many slender twiggy stems 6-10 dm. high. The collected specimens seem to have slightly smaller, less rugose, and less crenate leaves than do the other available collections of this species.

LXXVIII. SOLANACEÆ

348. *Datura discolor* Bernh.

Datura discolor Bernh., Trommed. N. Jour. Pharm. 26:149. 1838.—*Datura thomasi* Torr., Pacif. R. R. Rep. 5:362. 1856.—*Type locality*: West Indies.

Collected on Isla Partida (3226) where confined to talus slopes on the cliffs facing the ocean, and at Freshwater Bay on Tiburon Island (3260) where a single colony was noted in a sandy draw.

349. *Lycium richii* Gray

Lycium richii Gray, Proc. Am. Acad. 6:46. 1862.—*Lycium palmeri* Gray, Proc. Am. Acad. 8:292. 1870.—*Lycium hassei* Greene, Pittonia 1:222. 1888.—*Type locality*: La Paz, Lower California.

This is the common species of *Lycium* in the gulf area, and, according to Goldman (Contr. U. S. Nat. Herb. 16:364. 1916), the common one on the peninsula. Collections were made only at La Paz (3027, 3061) and Los Angeles Bay (3425), and on San Pedro Martir (3154), Raza (3215), Partida (3233), and Ildefonso (3747) islands. The plant, however, was present at nearly every station in the gulf area. Brandegee has a collection from San José del Cabo, and Palmer (71, 230) has collections from Guaymas. From these stations it extends northward to the Channel Islands off the coast of California.

The plant is usually a rigid, divaricately branched, open shrub 9-12 dm. high, but at La Paz it grows partially supported by other shrubs and becomes 25 dm. high. The flowers are lilac or violet, and are either 4- or 5-merous. The calyx varies considerably and it is quite evident that the elongated sepals must now be considered as merely indicative when present, and not the sine qua non of the species. Flowers with long sepals frequently occur on the same branch as other flowers with short sepals. It is not at all difficult to find specimens which are clearly of the same species, yet which could by the stressing of sepal length be violently and unnaturally dissoci-

ated. Short sepals appear erratically and in all degrees in peninsular material, a fact which indicated that sepal developments are not fixed in *L. richii* and so not worthy of taxonomic consideration. The plant from the Channel Islands (Catalina Island) which has long gone under the name of *L. richii*, seems best designated as *Lycium richii* var. *hassei*, n. comb. These plants have exceptionally long oblanceolate sepals.

Lycium richii seems to be nearest to *L. californicum* (which has a synonym in *L. carinatum* Wats.), from which it differs in somewhat larger, more tubular flowers, frequently lanceolate sepals, and oblanceolate to cuneate-obovate, broader, thicker leaves. The foliar difference between the two species is by far the most striking and satisfying.

A small-flowered *Lycium* grows in the cape region which Brandegee (Univ. Calif. Pub. Bot. 6:359. 1916) has named *L. peninsulare*. Though it is quite distinct from *richii* it is too close to *L. parvifolium* Gray (Proc. Am. Acad. 6:48. 1862) and seems better called *Lycium parvifolium* var. *peninsulare*, n. comb. The reflexed corolla lobes and protruding stamens, emphasized by Brandegee, are not always present even in his suite of specimens from the Cape region.

350. *Lycium umbellatum* Rose

Lycium umbellatum Rose, Contr. U. S. Nat. Herb. 1:74. 1890.—*Type locality*: La Paz, Lower California.

Collected at La Paz where it is infrequent on the low bluffs along the ocean and along the shallow arroyos near the shore. It forms rather open bushes 20-35 dm. high. The fruit is red and 8-10 mm. in diameter. This species seems to differ from *L. brevipes* Benth. (Bot. Sulph. 40. 1844), which originally came from Magdalena Bay, and from *L. fremonti* Gray (Proc. Am. Acad. 6:46. 1862) chiefly in its broader leaves. The species is densely villous glandular and more densely so than *fremonti*. *Lycium brevipes* is glabrate. The latter species has been greatly misunderstood or neglected. It is the same as *L. cedrosense* Greene (Pittonia 1:268. 1889) and is very close to *L. fremonti*. The original description of *brevipes* is meagre,

but that diagnosis supplemented by Mier's description and plate (Ill. So. Amer. Pl. 2:117, t. 69c. 1857) and by a fine series of specimens collected about the type locality by Brandegee, make the present use of the name practically certain. The *Lycium* species now known from the peninsula may be distinguished by the following key:

- Corolla small, 4-7 mm. long, rarely 7-8 mm., but then usually with lanceolate sepals.
- Corolla 4-5 mm. long, lobes usually recurved; stamens and style frequently conspicuously exerted; cape region..... *L. parviflorum*
- Corolla 5-7 mm. long, lobes spreading; stamens and style not conspicuously exerted.
- Leaves linear-oblongate, 1-2 mm. wide; sepals always short and broad; corolla averaging smaller and shorter than next; mainly near the ocean.... *L. californicum*
- Leaves oblanceolate to cuneate-obovate, commonly 4 mm. wide; sepals commonly lanceolate; not restricted to proximity of ocean..... *L. richii*
- Corolla large, 8-12 mm. long; sepals always short.
- Corolla cut halfway to base, tube 2 mm. long, lobes much exceeding the throat; San José del Cabo in salt marshes..... *L. carolinianum*
- Corolla cut less than one-fourth to base, tube 3-5 mm. long, lobes much shorter than throat.
- Leaves small, becoming 2-4 mm. wide; fruit 4-5 mm. broad; corolla slender; slender bushy shrub 1-2 m. high; northern part of peninsula..... *L. andersonii*
- Leaves large, becoming 8-14 mm. wide; fruit 8-14 mm. broad; corolla coarser; stout open shrub 1-4 m. high.
- Leaves glabrate, usually less than 8 mm. wide; western part of peninsula..... *L. brevipes*
- Leaves glandular-villous, usually 1 cm. wide; known only from La Paz..... *L. umbellatum*

351. *Nicotiana cleavelandi* Gray

Nicotiana cleavelandi Gray, Syn. Fl. N. A. 2:242. 1878.—
Type locality: Chollas Valley near San Diego, California.

Locally common on a dry shell-beach at La Paz (3029). Apparently a very common species in the western portions of the peninsula and on the adjacent islands.

352. *Nicotiana trigonophylla* Dunal

Nicotiana trigonophylla Dunal in DC., Prodr. 13: 562. 1852.
Type locality: Aguas Calientes, Mexico.

Referred here are collections from Guaymas (3090), San Pedro Martir Island (3150), Pelican Island (4282), Isla Partida (3234), Angel de la Guarda Island (3358), Sal si Puedes Island (3523). The material is not uniform, but contains two forms with very different pubescence. One, represented by the first four collections cited, has short glandless hairs and is only clammy viscid; the other, represented by the last two collections, is densely glandular villous-tomentose and is so oily that it heavily stains the collecting papers. The two forms deserve some nomenclatural recognition, but at present it seems impossible to determine which is the typical form. *Nicotiana palmeri* Gray (Syn. Fl. N. A. 2:242. 1878) of Arizona seems intermediate in its characters, but nearest to the eglandulose form. Though usually herbaceous in California the plants in the gulf area evince a tendency to persist more than a year. They even develop a ligneous base. The plants on Angel de la Guarda Island are especially notable for their rank growth, dense oily pubescence, and woody basal development.

353. *Physalis crassifolia* Benth.

Physalis crassifolia Benth., Bot. Sulph. 40. 1844.—*Physalis muriculata* Greene, Bull. Calif. Acad. Sci. 1:209. 1885.—*Type locality*: Magdalena Bay, Lower California.

A small collection of the typical phase of this species was made at San Francisquito Bay (3577). The species is widely distributed, extending from the Magdalena plain northward into California, Arizona and Nevada. The peninsular plants are certainly perennial. The corolla is rotate in typical material, but in the northeast part of the peninsula it varies into the funnellform shape characteristic of the following variety:

354. *Physalis crassifolia* var. *infundibularis*, n. var.

As in the species but corolla funnellform and as long or longer than wide.

Type: No. 1302, Herb. Calif. Acad. Sci., collected June 30, 1921, by I. M. Johnston (no. 4203) on a gravelly beach near the south end of **Angel de la Guarda Island, Gulf of California**.

Collected at San Luis Gonzales Bay (3325), Angel de la Guarda Island (3380, 4203), San Esteban Island (3174), and Los Angeles Bay (3483). Brandegee has collections from Calamujuet and Cajon de Santa Maria. The variety apparently replaces the species in that part of the peninsula, particularly the eastern part, lying between latitude 29° and 31° N. Certain collections from California (e.g., *Hall & Chandler 6809* from the Ord Mts.) may also be referable to the variety. The habits of the species and variety are similar, both being found in gravelly or sandy places, both having perennial roots and usually bushy or globose tops 1-6 dm. high. The surface of the plants may be glabrate, or as in the type of the variety, densely oily villous. There is no correlation between pubescence and flower form.

355. *Physalis versicolor* var. *microphylla* Rydb.

Physalis versicolor var. *microphylla* Rydb., Bull. Torr. Cl. 22:307. 1895.—*Type locality*: Guaymas, Sonora.

Frequent on San Francisco Island (3952) where it grows among small cobblestones on an elevated beach and forms bushy growths 2-4 dm. high. It is perennial and is heavily oily glandular-villous. The flowers are white with a sordid mustard-colored center. The plant also grows on San Diego Island, and the same or a very similar plant grows at El Mas-trador on Ceralbo Island. The variety may represent an ecological form, but it appears very different from the ample and thin-leave typical plant. The island collections agree very closely with isotypes of the variety.

There are seven species of *Physalis* on the peninsula. *Physalis æquata* and *P. angulata* were reported with doubtful determinations by Brandegee (Proc. Calif. Acad. Sci. II, 3:156. 1891) from San José del Cabo. The bases for these records appear to have been specimens of *P. pubescens* and *P. filipendula*. As Brandegee (*Zoe* 5:166. 1903) has pointed out, *P. hastata* Rydb. (Mem. Torr. Cl. 4:363. 1896) is synonymous with *P. glabra* Benth. *Physalis filipendula* Brandg.

(Univ. Calif. Pub. Bot. 10:187. 1922) is the peninsular representative of the wide-spread *P. philadelphica* group. It differs from *P. philadelphica* chiefly in its long pedicels which equal, instead of being much exceeded by, the petioles; it may be only a variety. The peninsular species of *Physalis* may be distinguished by the following key:

Plant annual.

Pedicels less than half the length of petioles.

Plants large, over 1 m. high; fruiting calyx very sharply angled, 4-6 cm. long, conspicuously subulate-acuminate*P. nicandroides*

Plants small, under 5 dm. high; fruiting calyx more rounded, 20-25 mm. long, not conspicuously acuminate*P. pubescens*

Pedicels equalling or exceeding petioles.

Anthers purplish or bluish; fruiting calyx 35 mm. long; leaves 5-14 cm. long; sepals at anthesis acuminate; pedicels filiform; plant simple below, branched above; cape region.....*P. filipendula*

Anthers yellow; fruiting calyx 20-25 mm. long; leaves 3-4 cm. long; sepals at anthesis deltoid; pedicels coarser; bushy plants, branched from base; northern Lower California.....*P. greenii*

Plant perennial.

Leaf blade lanceolate; stems very elongate, prostrate or clambering*P. glabra*

Leaf blade ovate-deltoid or cordate; bushy tufted erect-growing plants.

Leaves all conspicuously crenate and usually thin; corolla with dark center, usually small, turning purplish in drying.....*P. versicolor*

Leaves entire or mostly so, usually thickish; corolla yellow, usually large, not turning purplish in drying.

Corolla rotate*P. crassifolia*
Corolla funnellform*P. c. infundibularis*

356. *Solanum hindsianum* Benth.

Solanum hindsianum Benth., Bot. Sulph. 39. 1844.—*Type locality*: Magdalena Bay, Lower California.

A common shrub in the gulf area. Collections were made at La Paz (3060), San Esteban Island (3178), Angel de la Guarda Island (3421, 4201), and Tepoca Bay (3302). It was

observed on South San Lorenzo, Santa Cruz, San Josef, San Francisco, Espiritu Santo, and Ceralbo islands; and at Santa Rosalia and San Francisquito Bay. According to Goldman (Contr. U. S. Nat. Herb. 16:364. 1916) the plant is common on the peninsula between the towns of San Francisquito and San Ignacio. The most northern collection seems to have been made at San Quintin by Orcutt. It appears to be rare in the cape region, La Paz and San José del Cabo being the only reported stations there. Much less is known of its distribution in Sonora. It must be wide-spread for Palmer collected it at Guaymas and MacDougal is accredited (Contr. U. S. Nat. Herb. 16:17. 1912) with a collection in the Pinacate Mountains in the northern part of the state.

The plant is a shrub 10-25 dm. high with a few long branches which are usually spreading though not infrequently strict. Gray refers the species to *S. elæagnifolium*, but the two species seem amply distinct. They differ in habit of growth, root, size of flower, direction and length of pedicels, size, thickness and margin of leaves, and in distribution.

LXXIX. SCROPHULARIACEÆ

357. *Antirrhinum cyathiferum* Benth.

Antirrhinum cyathiferum Benth., Bot. Sulph. 40, t. 19. 1844.
—*Antirrhinum chytrospermum* Gray, Proc. Am. Acad. 12:81. 1876.—*Type locality*: Magdalena Bay, Lower California.

Collected at the north (3386) and south (4202) ends of Angel de la Guarda Island, at the north end of Tiburon Island (4414), at San Francisquito Bay (3575), and at San Nicolas Bay (3730). There are specimens in the Brandege collection from Magdalena Island, Calmalli, and Santa Gertrudis. It is apparently widely distributed over the peninsula. An unattractive, glandular annual herb with coarse, erect stems, a very floriferous habit, and very peculiar seeds that strongly suggest those of Mohavea. A study of the type of *A. chytrospermum* reveals no characters by which it can be separated from Bentham's species. Regarding this relation, see the notes by Curran (Proc. Calif. Acad. Sci. II, 1:234. 1888), and Vasey and Rose (Contr. U. S. Nat. Herb. 1:74. 1890).

358. *Bacopa monniera* (L.) Wetts.

Bacopa monniera Wetts., in E. & P., Nat. Pflanzenf. 4^b:77. 1891.—*Gratiola monniera* L. Syst. Nat. ed. 10, 851. 1759.—*Herpestis monniera* H.B.K., Nov. Gen. et Sp. 2:366. 1817.—*Type locality*: Jamaica.

Forming mats on wet, weakly alkaline soil at Loreto (3798) and San Evaristo Bay (4092). The only other peninsular collections are those by Brandegee from Todos Santos and San José del Cabo.

359. *Conobea intermedia* Gray

Conobea intermedia Gray in Torr., Bot. Mex. Bound. 117. 1859. *Stemodia polystachya* Brandg., Proc. Calif. Acad. Sci. II, 2:191. 1889.—*Conobea polystachya* Minod, Bull. Soc. Genève, II, 10:226 (1918).—*Type locality*. About the Copper Mines, New Mexico.

Found only on Espiritu Santo Island (3976) where it grows in dirt-filled crevices on the mesa-like summits of the basalt ridges near the crest of the island just north of the Isthmus. It is a perennial, prostrate herb. The plants from New Mexico seem to be annuals and it is possible that Brandegee's name may be used for the peninsular form. Brandegee (*Zoe* 5:168. 1903) has reduced his own species to synonymy. The genus *Conobea* is very close to *Stemodia*, but, as sessile anther-cells and divided leaves seem to run constant through the former, it probably is distinct.

360. *Galvezia juncea* (Benth.) Gray

Galvezia juncea Gray, Proc. Am. Acad. 22:311. 1887.—*Maurandia juncea* Benth., Bot. Sulph. 41. 1844.—*Antirrhinum junceum* Gray, Proc. Am. Acad. 7:377. 1868.—*Saccularia veatchii* Kell., Proc. Calif. Acad. Sci. 2:17. 1860.—*Type locality*: West coast of Lower California, probably at San Quintin.

The typical form of the species is, as pointed out by Brandegee (*Zoe*. 5:167. 1903), the glabrate plant with reduced leaves. It appears to range over the western part of the peninsula, particularly in the middle and northern portions. There are

collections in the Brandegee herbarium from Cedros Island, Salado Cañon, San Julio Cañon, and Calmalli. The collections mentioned by Goldman (Contr. U. S. Nat. Herb. 16:364. 1916) are probably also referable here. No collections were made of this plant.

361. *Galvesia juncea* var. *foliosa*, n. var.

Galvesia glabrata Brandg., Zoe 5:167. 1903.—*Type locality*: San Felipe, Lower California.

Collected on San Pedro Nolasco Island (3133), on South San Lorenzo Island (3530), and at Las Animas Bay (3510). In the Brandegee collections there are specimens from San Felipe and Saucito. The type is a very slender form in which the branches have a suggestion of the prehensile nature characteristic of *Antirrhinum*. In other than its slenderness, the type is identical with our specimens, having the same glaucous stems and large glabrous leaves. The variety differs from the species only in its well-developed foliage.

The plant always occurred about cliffs where it either grew on the talus or on ledges on the cliff-face. It is commonly a loose, erectly branched, weak-stemmed shrub. Usually it is 9-12 dm. high but, when supported, it frequently attains twice that height. The corolla is scarlet outside and pallid inside, bearing tawny bristles on the strongly embossed insect-guides of the palate. The four stamens are flattened and densely villos below.

362. *Galvesia juncea* var. *pubescens* (Brandg.), n. comb.

Galvesia speciosa var. *pubescens* Brandg., Zoe 5:167. 1903.—*Galvesia rupicola* Brandg., Univ. Calif. Pub. Bot. 6:360. 1916.—*Type locality*: On the rocks of Cape San Lucas, Lower California.

Specimens of this variety were collected on Angel de la Guarda (3420) and Espiritu Santo (3980) islands. The specimens from Angel de la Guarda presents one of those sad cases where two forms grow from one root, for part of the plant, the most in fact, has the characters of the variety *pubescens* while certain branches and leaves are typical of the variety

foliosa. The specimen which is the common type of Brandegee's species and variety, and a collection from Saucito have been also studied. Brandegee (Proc. Calif. Acad. Sci. II, 3:225. 1892) admits that the cape plant approaches *juncea* even about its type locality. The variety is evidently only the pubescent state of the variety *foliosa*.

363. ***Maurandya flaviflora*, n. sp.**

Perennial (?) forming loose mat-like growths 2-5 dm. broad and about 1 dm. high; clammy-oily villous throughout; stems slender, branched mainly near base; leaves bright green, thin, numerous, alternate, very broadly cordate or reniform, coarsely serrate, 20-25 mm. long, 25-40 mm. wide; petioles slender, non-tortuous, 1-3 cm. long; flowers axillary; pedicels slender 20-25 mm. long, in fruit becoming coarse contorted and 5-10 cm. long; calyx 5-parted, in flower 11-12 mm. long with lobes foliaceous and the upper the longest (9 mm. long), accrescent in fruit becoming firmer with lobes ovate and tube more developed; corolla pale yellow, cylindrical, glabrate outside, 25-28 mm. long; corolla-tube 4-5 mm. long, 4 mm. broad, glabrous within, stamens attached at about the middle and adnate to beginning of throat; corolla-throat amplified, 7-8 mm. wide at the middle, about 15 mm. long, within the lower part pubescent with numerous short flat yellow hairs (as is also the lower part of the filaments); corolla lobes broadly ovate or orbicular, not spreading, upper pair longest and united for about a third their length, lower lobes 3-4 mm. long with middle one the shortest; stamens 4, protruding 2-6 mm., fifth represented by small appendage near middle of corolla tube and between shorter pair of filaments; filaments flat, upper pair shortest being only 25 mm. long, lower pair about 28 mm. long; anther-sacs about 1.25 mm. long, circular, discrete, divergent, dehiscent about margins; pistil filiform, equalling or longer than stamens; fruit a turgid laterally compressed many-seeded capsule about 1 cm. broad; valves short-acuminate, above forming 2 crest-like apices in whose sinus is borne the subsistent style; seeds brown with high irregular coarse corky longitudinal ridges, oblong, almost 2 mm. long.

Type: No. 1303, Herb. Calif. Acad. Sci., collected May 8, 1921, by I. M. Johnston (no. 3504) from the walls of a narrow cañon in the hills near **Las Animas Bay, Lower California.**

This remarkable species was seen but once, in a very interesting little gorge in the hills about 3 km. south from the head of Las Animas Bay at an altitude of about 250 m. It grew from crevices on a sheltered cliff at the head of the gorge and was locally rather common. It differs from all other members of its genus in having tortuous pedicels, crested capsules, protruded stamens, and yellow corollas with non-spreading lobes. It appears to be separated by part of the Sierra Madre and over 7 degrees of longitude from its closest congener. The nearest relative seems to be *M. geniculata* Robins. & Fern., a form which may be only the apterous phase of *M. erecta* Hemsley. By Hemsley's revision of the genus (Gard. Chron. II, 17:22. 1882) the new species would fall with *M. barclayana* and *M. scandens*, but most decidedly its relations are not there. It seems quite evident that the past treatments of *Maurandya*, based, as they mainly are, on seeds, are unnatural, and that they separate species which are certainly related. A much better treatment can be made by the use of other characters and with only subsidiary use of seed developments; for example, the following synopsis:

- Body of seed flat; sepals thick, gibbose below, midrib and reticulate veining very evident. Subgenus **Epixiphium**.....*M. wislizeni* Engelm.
- Body of seed circular in cross-section, thick; sepals foliaceous, not evidently ribbed or veined, not at all gibbose. Subgenus **Eumaurandya**.
- Anther-sacs oblong, confluent or in contact; calyx parted, lobes lanceolate; leaves deltoid, glabrous; vines. §**US-TERIA**.
- Calyx conspicuously long glandular pubescent*M. barclayana* Lindl.
- Calyx glabrate.....*M. scandens* (Cav.) Pers.
- Anthers-circular, discrete; calyx cleft, lobes ovate; leaves circular or cordate or reniform, pubescent; erect or prostrate or climbing. §**LOPHOSPERMUM**.

- Stems short (1-4 dm. long), not climbing; sepals not imbricate.
- Corolla yellow, lobes erect; stamens exserted; pedicels tortuous; leaves thin, obtusely pointed, coarsely dentate; seeds apterous.....*M. flaviflora* Johnston
- Corolla purplish, lobes spreading or reflexed; stamens included; pedicels straight or geniculate; leaves firm, rounded, sinuate.
- Seeds apterous; fruiting pedicels thickened, geniculate.....*M. geniculata* Robins. & Fern.
- Seeds alate; fruiting pedicels spreading or ascending.....*M. erecta* Hemsley
- Stems elongate and climbing; sepals conspicuously imbricate.
- Plant densely soft pubescent, grayish; sepals oblong-ovate.....*M. erubescens* (Don) Gray
- Plant glabrate, green.
- Sepals ovate- or cordate-oblong. (*M. purpusii* Brandg.).....*M. e.* var. *purpusii* (Brandg.)
- Sepals lanceolate. (*M. lophospermum* Bailey).....*M. e.* var. *glabrata*, n. name

364. *Mimulus dentilobus* Robins. & Fern.

Mimulus dentilobus Robins. & Fern., Proc. Am. Acad. 30:120 (1894).—*Type locality*: Nacory, Sonora.

A diminutive plant, which Mrs. Adele Grant questionably refers to the above species, was frequent at about 400 m. altitude in a large cañon back of Escondido Bay (4113). It is yellow-flowered and forms matted, herbaceous growths along seeps and in moist sand.

365. *Mohavea confertiflora* (Benth.) Heller

Mohavea confertiflora Heller, Muhl. 8:48. 1912.—*Antirrhinum confertiflorum* Benth. in DC., Prodr. 10:592. 1846.—*Mohavea viscida* Gray, Pacif. R. R. Rep. 4:122. 1857.—*Type locality*: Doubtfully Californian.

Collected on a silty flat near the south end of Angel de la Guarda Island (4228) and observed on the gravelly plain back of Puerto Refugio at the north end of the island. The speci-

mens represent the linear-leaved form of the species. It grew as a rank, coarse-stemmed, very glandular annual 45 cm. high with long widely ascending branches.

366. *Penstemon clevelandi* var. *angelicus*, n. var.

Differing from species in narrow sub-racemose inflorescence, oblong or lanceolate sepals, beardless sterile stamens, and cuneate-obovate upper leaves.

Type: No. 1304, Herb. Calif. Acad. Sci., collected May 3, 1921, by I. M. Johnston (no. 3413) from a sheltered ledge in Palm Cañon on **Angel de la Guarda, Gulf of California.**

A few plants of this new variety were found about 3 km. from shore on a sheltered ledge of a basaltic cliff in a short, gorge-like, constriction of Palm Cañon on Angel de la Guarda Island (3413). When collected the plant was in an advanced state of fruiting, but flowers were found on the ground. It is a short-lived perennial with several erect stems 6-12 dm. high. The variety is certainly a close relative of *P. clevelandi*, but further collections may justify its treatment as a distinct species. Its unique development is its racemiform inflorescence, the pedicels of which are much reduced, being only about 2 mm. long and much exceeded by the subtending bracts. The other characters of *angelicus* are individually approached by variations in typical *P. clevelandi*, but in no specimen have they been found in the combination characteristic of the type of *angelicus*. The narrow sepals are not absolutely constant even in the type of the variety, some of the calyx-lobes near the base of the inflorescence being ovate and having nearly the size and shape of those in typical *clevelandi*. The bearding of the sterile filament in *P. clevelandi* seems to be uncertain, as Brandege's Ubi collection, which is otherwise good *clevelandi*, has naked filaments, and a dubious collection from near Campo (*Abrams 3619*) also has them bald. The leaves in *angelicus* are always largest above the middle, but even that condition is approached by a very mature collection made by Brandege on April 1, 1896, at Agua Caliente in San Diego County, California. Most of the leaves in the Agua Caliente collection are withered, and it can not be definitely determined whether or not all the leaves are cuneate like the single flattened one.

367. *Russelia verticellata* H.B.K.

Russelia verticellata H.B.K., Nov. Gen. et Sp. 2:360. 1817.
—*Type locality*: Puento de la Madre de Dios, Mexico.

On Ceralbo Island (4062), in a cañon back of El Mastrador, this shrub forms junciform tufts in rock crevices on the cañon side. It was locally abundant, but at the time of collecting was nearly leafless and with very mature capsules. It grows a meter high. The plants are glabrate and readily fall into *verticellata* of Robinson's synopsis (Proc. Am. Acad. 35:320. 1900). It appears to range over the cape region and to vary greatly in pubescence; some plants, because of their pubescence, falling into *R. polyhedra* of the synopsis. Regarding this variability, see the note by Brandegee (Proc. Calif. Acad. Sci. II, 3:156. 1891).

368. *Stemodia durantifolia* (L.) Swartz

Stemodia durantifolia Swartz, Observ. Bot. 240. 1791.—
Capraria durantifolia L., Syst. Nat. ed. 10, 1116. 1759.—
Type locality: Jamaica.

A single plant was found at about 300 m. altitude on moist gravel on a cañon floor in the Sierra Giganta back of Escondido Bay (4112). Though not particularly common, the species ranges widely over Lower California. The present collection has a dark purplish-brown corolla whose lower lobe is folded inwardly to form a knife-like plait about 0.33 mm. high which runs the length of the corolla throat. This plicate condition is contrary to the generic diagnosis, but the plant evidently belongs to the species indicated. A hasty examination has not revealed similar developments in any other material of *S. durantifolia* available.

LXXX. BIGNONIACEÆ

369. *Tecoma stans* (L.) Juss.

Tecoma stans Juss., Gen. Pl. 139. 1774.—*Bignonia stans* L., Sp. Pl. ed. 2, 871. 1763.—*Stenolobium stans* Seem., Jour. Bot. 1:88. 1863.—*Type locality*: "Insulis antillis."

Collected at Agua Verde Bay (3876) and at Escondido Bay (3846), and noted under cultivation on the plazas at Loreto

and Guaymas. All the plants seen were shrubs growing 20-35 dm. high but usually averaging about 25 dm. in height. The sterile bush most strikingly simulates a young ash. Growing naturally in gravel in open cañons or on the alluvial fans at their mouth. Brandegee (Zoe 2:148. 1891) reported wild plants only from the cape region, but the above mentioned collections were taken over 170 km. north of that region.

LXXXI. MARTYNIACEÆ

370. *Proboscidea altheæfolia* (Benth.) Decaisne

Proboscidea altheæfolia Decaisne, Ann. Sci. Nat. V. Bot. 3:324. 1865.—*Martynia altheæfolia* Benth., Bot. Sulph. 37. 1844.—*Martynia palmeri* Wats., Proc. Am. Acad. 24:66. 1889.—*Type locality*: Magdalena Bay, Lower California.

A single flowering plant was found in a wash back of San Luis Gonzales Bay (3366), but fruit was collected at San Francisquito Bay (3590) and on San Francisco Island (3959). The plant was most abundant on the dunes about the landing on Ceralbo Island near Gordas Point, for there the dried fruit was so abundant as to become entangled in large masses and to be blown about by the wind.

LXXXII. ACANTHACEÆ

371. *Anisacanthus thurberi* Gray

Anisacanthus thurberi Gray, Syn. Fl. N. Am. 2:328. 1878.—*Drejera thurberi* Torr., Bot. Mex. Bound. 124. 1859.—*Type locality*: Las Animas, Sonora.

Frequent on a gravelly cañon floor at the head of San Carlos Bay (4360). It is a shrub 10-18 dm. high formed of strict, tufted, slender stems. The bark is white, the internodes long, and the leaves few in the plants seen. This collection sets the southern limit for the species. It differs from more northern material only in its slightly less pubescent foliage.

372. *Beloperone californica* Benth.

Beloperone californica Benth., Bot. Sulph. 38. 1844.—*Type locality*: Cape San Lucas, Lower California.

Collected on Tiburon (3250, 4245), San Esteban (3188), and Espiritu Santo (4079) islands. The latter collection is atypical in having a glandular open inflorescence composed of numerous slender branches.

373. *Berginia virgata* Harv.

Berginia virgata Harv. in Benth. & Hook., Gen. Pl. 2:1097. 1876.—*Pringleophytum lanceolatum* Gray, Proc. Am. Acad. 20:293. 1884.—*Type locality*: "California," probably from Sonora.

Collected in a large wash at Guaymas (3114), in a cañon at Las Animas Bay (3509), in a wash at San Nicolas Bay (3729), and in a dry stream-way on Carmen Island (3820). It is a loosely branched shrub 8-20 dm. high. The two erect upper lobes and the throat of the corolla are white. The lower corolla lips are pink with a medial white area bordered by ciliate lines. The material from San Nicolas Bay and Carmen Island has glandular calyces.

374. *Carlowrightia californica* Brandg.

Carlowrightia californica Brandg., Zoe 5:172. 1903.—*Type locality*: Comondú, Lower California.

On Ceralbo Island (4052) this is very common on the broad gravelly floor back of Ruffo's ranchhouse. The locality is overgrazed and the plants growing in the open were browsed down to flattened, very twiggy mats, whereas those growing in the shelter of cacti produced long loosely branched open growths 3-6 dm. high. The locality was visited in early June when all the leaves were shed. Lacking leaves the determination can not be positively made.

A collection made on a rocky slope of the ridge directly back of Guaymas seems to be referable to *californica*. It is an open, irregularly branched undershrub 6 dm. high or less, growing self-supported or supported by other shrubs up through which it grows. The leaves are a trifle small, but otherwise it seems to agree with Brandegees's type.

The species is probably nearest to *C. cordifolia* Gray, if, indeed, it is distinct. In this regard, compare the notes by Vasey and Rose (Contr. U. S. Nat. Herb. 1:75. 1890) and by Brandegee (Proc. Calif. Acad. Sci. II, 3:159. 1891).

375. *Carlowrightia californica* var. *pallida*, n. var.

As in the species, but stems pallid with a close minute canescent tomentum.

Type: No. 1305, Herb. Calif. Acad. Sci., collected April 20, 1921, by I. M. Johnston (no. 3195) in a wash on San Esteban Island, Gulf of California.

This is a very brittle intricately branched, rounded shrub 3-6 dm. high which is very common on a broad gravelly cañon floor on San Esteban Island (3195). All the plants seen had very pallid stems and appeared very different from *C. californica*.

376. *Carlowrightia pectinata* Brandg.

Carlowrightia pectinata Brandg., Proc. Calif. Acad. Sci. II, 3:160. 1891.—*Carlowrightia fimbriata* Brandg., Proc. Calif. Acad. Sci. II, 3:161. 1891.—*Type locality*: Shaded hillsides at San José del Cabo, Lower California.

A very poor specimen of apparently this species was collected on a gravelly cañon floor at San Carlos Bay (4388). It appears to be a strictly branched winter annual or, possibly, a short-lived perennial. Its larger cauline leaves are lacking, the only leaves present being those borne on short axillary shoots. It agrees with the type in essentials, possessing a similar habit and floral developments, as well as the same shreddy papery bark.

377. *Dicliptera resupinata* (Vahl.) Juss.

Dicliptera resupinata Juss., Ann. Mus. Hist. Nat. Paris 9:268. 1807.—*Justicia resupinata* Vahl., Enum. Pl. 1:114. 1804.—*Type locality*: "Nova Hispania."

Not infrequent in gravelly ground about San Pedro and San Carlos (4363) bays. It is a loosely branched herb which grows up through shrubbery and becomes 3-6 dm. high. The flowers are pinkish.

378. *Elytraria squamosa* (Jacq.) Lindau

Elytraria squamosa Lindau, Anal. Inst. Fis. Geogr. Costa Rica 8:299. 1896.—*Verbena squamosa* Jacq., Pl. Hort. Schonbr. 1:3, t. 5. 1797.—*Tubiflora squamosa* Kuntze, Rev. Gen. 2:500. 1891.—*Elytraria tridentata* Vahl., Enum. Pl 1:107. 1804.—*Type locality*: Not given.

Growing among rocks in the hills back of Guaymas (3092) and San Carlos Bay (4389), and in a similar situation in a cañon in the Sierra Giganta back of Agua Verde Bay (3897). It was fairly common at the former stations, but rare at the last mentioned.

379. *Jacobinia ovata* var. *subglabra* Wats.

Jacobinia ovata var. *subglabra* Wats., Proc. Am. Acad. 24:67. 1889.—*Type locality*: Near Guaymas, Sonora.

Collected in a steep draw on the east side of the ridge directly back of Guaymas (3095). The shrub was 9-12 dm. high and formed a small local colony. At San Pedro Bay (4312) the plant grew from crevices on a cañon wall forming a weak, open shrub 6-12 dm. high.

380. *Justicia insolita* Brandg.

Justicia insolita Brandg., Proc. Calif. Acad. Sci. II, 2:195. 1889.—*Type locality*: San Gregorio, Lower California.

Collected at San Nicolas Bay (3702) where a single dense globose bush was found in a gravelly wash. It formed a compact, very twiggy and intricately branched growth about 1 m. in height. It has a very clean appearance and has closely tomentose snow-white stems which contrast sharply against the light green of the foliage. The lower lips of the corolla are violet, but the upper lips are white. This species seems to be rare north of the cape region, for, besides the present collection, the only ones north of that region are the type collection from San Gregoria and the one from between San Ignacio and Santa Rosalia reported by Goldman (Contr. U. S. Nat. Herb. 16:366. 1916).

381. *Ruellia californica* (Rose), n. comb.

Calophanes californica Rose, Contr. U. S. Nat. Herb. 1:85. 1890.—*Type locality*: Santa Rosalia, Lower California.

Collected at Mulegé (3681), San Nicolas Bay (3725), Loreto (3781, 3793), Carmen Island (3808, 3830), Tiburon Island (4268), and Guaymas (3088). A globose bush about 1 m. high which is very pretty when covered with its large, fragrant, purple blossoms. A pink-flowered form was collected on Carmen Island. It is most abundant in gravelly washes, but is frequently quite common on rocky hillsides.

This species has a very close relative in *R. peninsularis*, but differs in having dull oily glandular-pubescent foliage and not glabrate foliage which is glutinous and somewhat shiny. The original collection of *R. californica* had extremely large flowers, but that character varies and Rose (Contr. U. S. Nat. Herb. 1:133. 1892) later admitted small-flowered plants to his species with only a passing comment. The calyx is the only other structure in which there is a notable interspecific difference. Very generally it can be said that *R. peninsularis* has shorter calyces than *R. californica*, but this is only a tendency and the calyx-size does not always run parallel with the conspicuous and geographically-linked difference in pubescence. *Ruellia californica* and *R. peninsularis* are kept apart solely on a difference in pubescence, a difference which seems to be unmarred by intergrades.

Rose referred this species to *Calophanes*, but its whole appearance is strange in that genus, whereas it is closely approximated in *Ruellia*. The reason for considering the species a *Calophanes* seems to be that, "though it resembles very much certain species of *Ruellia*" it "has the mucronate anthers and four-seeded capsules of *Calophanes*." Anthers have been examined from 17 collections representing this species and *R. peninsularis*, and only anthers with blunted bases can be found. None of the anthers present a sharpened or mucronate condition; in fact they appear less sharp than do those in *R. tuberosa*, the type of the genus *Ruellia*. Although the capsules usually have four seeds, five, or much less rarely six, ovules or seeds occur in some capsules. The reference to *Ruellia* is

further strengthened by the fact that both of Rose's species have the alveolate roughened pollen grains of *Ruellia*, rather than the grooved grains characteristic of *Calophanes*.

382. *Ruellia peninsularis* (Rose), n. comb.

Calophanes peninsularis Rose, Contr. U. S. Nat. Herb. 1:75. 1890.—*Type locality*: Mesas about La Paz, Lower California.

Collected only on the low bluffs that face the sea just east of La Paz (3037). It is a compact, twiggy shrub somewhat under 1 m. high. The corolla is purple with a yellowish throat, and drops very readily when the plant is handled. This is the common violet-flowered *Ruellia* of the cape region and in part the "*Ruellia* sp." mentioned by Goldman (Contr. U. S. Nat. Herb. 16:366. 1916.). The species also occurs across the gulf about Guaymas, for *Palmer 196* (cf. Wats., Proc. Am. Acad. 24:66. 1889) and Brandegees collection of 1893 seem to be the same.

Besides *R. peninsularis* and *R. californica*, there are two other *Ruellias* known from the peninsula: viz., *R. leucantha* Brandg. (*Zoe* 5:109. 1901) which is known only from the cape region where it is reported common, and *R. cordata* Brandg. (*Zoe* 5:173. 1903), which is known only from the type collection made at Comondú. The peninsular *Ruellias* may be distinguished as follows:

- Leaves cordate; sepals spatulate; calyx borne on long pedicels (8-20 mm. long) and closely subtended by conspicuous foliaceous bracts.....*R. cordata*
- Leaves ovate, acuminate; sepals linear-lanceolate; calyx borne on very short (1-3 mm. long) pedicels and subtended by inconspicuous subulate bractlets.
- Flowers white, 5-6.5 cm. long; plant densely pubescent with non-glandular hairs; leaves becoming 45-65 mm. long and 25-35 mm. wide; capsule obovate, canescent, 8-9 ovuled.....*R. leucantha*
- Flowers purple, 3-5 cm. long; plant glabrate to densely glandular pubescent; leaves becoming 20-45 mm. long and 25-35 mm. wide; capsule oblanceolate, glabrate, 4-6 ovuled.
- Foliage glabrate, glutinous, rather shiny.....*R. peninsularis*
- Foliage densely glandular-pubescent, dull.....*R. californica*

LXXXIII. PLANTAGINACEÆ

383. *Plantago minima* Cunningham

Plantago minima Cunningham, Proc. Indiana Acad. 1896:202. 1897.—*Plantago insularis* Eastw., Proc. Calif. Acad. Sci. III, 1:112. 1898.—*Plantago brunnea* Morris, Bull. Torr. Cl. 27:115. 1900.—*Plantago fastigata* Morris, Bull. Torr. Cl. 27:116. 1900.—*Plantago scariosa* Morris, Bull. Torr. Cl. 27:117. 1900.—*Type locality*: Lincoln, Nevada.

A very abundant annual in sandy ground at Puerto Refugio on Angel de la Guarda Island (3384). This plant represents the common form of the patagonica-group present on the deserts and islands off southern California. It ranges south of the international boundary and is apparently the only "species" of the group present on the peninsula. In its extremes it differs from *P. erecta* in its silky-villous herbage and in its proportionately longer floral bracts, but intergrades seem to occur, and perhaps *minima* is no more than a variant of *erecta*, and the latter only a form *P. patagonica*.

LXXXIV. RUBIACEÆ

384. *Coutarea pterosperma* (Wats.) Standley

Coutarea pterosperma Standley, N. Am. Fl. 32:127. 1921.—*Portlandia pterosperma* Wats., Proc. Am. Acad. 24:52. 1889.—*Type locality*: Cañons near Guaymas, Sonora.

About a dozen trees were found in a steep rocky gulch on the east slope of the ridge just back of Guaymas (3099). Only a single tree was in leaf, the others being naked but in full fruit. They grew 25-35 dm. high and had comparatively few ascending branches. The species was again seen in a rocky cañon at San Carlos Bay (4358) where it was infrequent on the gravelly cañon floor and formed an erect little-branched shrub 18-24 dm. high.

385. *Houstonia brevipes* Rose

Houstonia brevipes Rose, Contr. U. S. Nat. Herb. 1:83. 1890.—*Type locality*: Near Santa Rosalia, Lower California.

Collected at Las Animas Bay (3499), South San Lorenzo Island (3540), San Marcos Island (3619), Coyote Bay

(4167), San Nicolas Bay (3723), near Loreto (3790), Carmen Island (3811), Escondido Bay (3851, 4132), and Ceralbo Island (4028). Although collected on the beach at Coyote Bay, the plant is characteristic of, and more common in gravelly cañons away from the influence of the ocean. It is a more or less shrubby herbaceous perennial with erect-growing tufted glaucous stems 2-6 dm. high. The corolla is pink with the tube less dark than the lobes. The collection from Carmen Island is very slender, but appears to be otherwise typical. Referable to *H. brevipes* are San Gregorio collections of Brandegee and a Purpus collection (164) from Calmalli. The plant reported from the cape region by Brandegee (Proc. Calif. Acad. Sci. II, 3:142. 1891) as *H. brevipes* in fact represents the very distinct *H. australis*. The range of *H. brevipes* is the middle part of the peninsula and south along the gulf to Ceralbo Island.

386. *Houstonia gracilentia*, n. sp.

A decumbent shrub forming a depressed growth about 2 dm. high and 8 dm. broad, inconspicuously glandular or glabrous throughout; old stems woody with a roughened grayish or brownish bark, not stout; leaf-bearing branches erect, 8-10 cm. long, more or less shiny, angled, slender, internodes 1-2 cm. long; leaves opposite, sessile, frequently fascicled in the axils, linear-filiform, acute, about 1 cm. long, 0.75 mm. wide, flattened, coriaceous; stipules triangular or minute, bearing 1-2 gland-tipped prolongations; flowers in loose few-flowered terminal cymes; peduncles about 1 cm. long; hypanthium 0.5-0.66 mm. high at anthesis; sepals lanceolate, slightly over 1.5 mm. long, scarcely accrescent; corolla 12 mm. long, salverform, tube pink, 5.5-6 mm. long; throat cylindrical, 3 mm. long, pink with 5 rose-colored lines extending down upon it from the corolla lobes; lobes oblong, acutish, rose-colored, about 2 mm. long; style and stamens included; mature fruit oblong-globose, slightly less than 2 mm. long, less than 1.5 mm. wide, $\frac{2}{3}$ - $\frac{3}{4}$ inferior; seeds unknown.

Type: No. 1306, Herb. Calif. Acad. Sci., collected May 27, 1921, by I. M. Johnston (no. 3927) on a rocky hillside of San Diego Island, Gulf of California.

Though this plant superficially much resembles *H. brevipes*, it is in fact a very close relative of *H. mucronata*. The first impression gained upon comparing the plant with *mucronata* is that of utter dissimilarity, but a close analytical study shows that the different aspect of *gracilentata* results from the relative slenderness that pervades all its structures. The only notable differences possessed by *gracilentata* seem to be the smaller capsules and a laxer habit of growth. *Houstonia gracilentata* is proposed as a distinct species only because *mucronata* is so constant throughout its range and so characteristic in its habits and aspect. The new species presents such a violent departure from the reoccurring growth form of *mucronata* that its description as new can be justified on that ground alone. In the field it was mistaken for *brevipes*, but a study of the material soon showed that the specimens had woody, angled, non-glaucous stems and very long sepals; characters which plainly allied it with *H. mucronata*. As an ally of *mucronata* the rocky seaward island slopes are not extraordinary habitats, for typical *mucronata* was collected in exactly similar situations in other parts of the gulf. The differences that characterize *H. gracilentata* are not to be explained away as of ecologic origin.

387. *Houstonia mucronata* (Benth.) Robinson

Houstonia mucronata Robinson, Proc. Am. Acad. 45:401. 1910.—*Hedyotis mucronata* Benth., Bot. Sulph. 19. 1844.—*Houstonia fruticososa* Rose, Contr. U. S. Nat. Herb. 1:132. 1892.—*Type locality*: Magdalena Bay, Lower California.

Observed on the beach at Coronado Island (3755), Carmen Island (3836) Danzante Island (3859), Monserrate Island, Agua Verde Bay (3895), San Diego Island, San Francisco Island (3954), and Ceralbo Island (4035). The plant was usually abundant where found, growing primarily on beaches or on dunes, though not infrequently extending onto seaward cliffs and slopes. It is a distinctly shrubby bush 2-9 dm. high. The corolla is white, with the tube and the lobes rose-colored outside; in drying all color is lost. The specimens of this species from the west coast of the peninsula differ from the gulf collections in being more slender, less woody, and in

having leaves that are perceptibly narrowed at the base. If these differences hold the gulf plant may deserve varietal rank. The plant of the Pacific shore perhaps is uncommon, for Mr. Brandegee knows it solely on Magdalena Island where he succeeded in finding only one small colony.

The relations of the peninsular species of *Houstonia* may be seen from the following key. *Houstonia brandegeana* Rose (Contr. U. S. Nat. Herb 1:70. 1890) can scarcely be distinguished from Bentham's *H. asperuloides* (Bot. Sulph. 19, t. 13, 1844). The characters given by Rose are not correlated and are not decisive, while at least in flower measurements *brandegeana* has the characters of the older *asperuloides*. *Houstonia prostrata* Brandg. (Zoe 5:105. 1901), *H. arenaria* Rose (Contr. U. S. Nat. Herb. 1:70. 1890), *H. peninsularis* Brandg. (Zoe 5:160. 1903), and *H. australis* Johnston (Univ. Calif. Pub. Bot. 7:446. 1922) all seem very distinct species:

Plant annual.

Capsules on recurved pedicels, bilobed, 3 mm. broad, less in length; prostrate.....*H. prostrata*

Capsules erect, unlobed, 1-2 mm. broad, more in length; erect.

Flowers all on long (1-3 cm.) filiform pedicels; leaves small, narrow, 3-20 mm. long, 0.5-1.5 mm. wide; stems terete, erect; fruit globose.....*H. asperuloides*

Flowers nearly all sessile; leaves comparatively large, 2-6 cm. long, 2-8 mm. wide; stems quadrate with spreading branches; fruit usually ovate or oblong*H. arenaria*

Plant perennial.

Stems angled, shrubby nearly throughout; coastal.

Plant stout, bushy; annual growths 6-8 cm. long, internodes 5-10 mm. long; leaves linear, about 1 mm. wide; capsule 2-2.5 mm. long, over 2 mm. wide; widely distributed.....*H. mucronata*

Plant slender, spreading; annual growth 8-10 cm. long, internodes 1-2 cm. long; leaves linear-filiform, about 0.75 mm. wide; capsule 2 mm. long, less than 1.5 mm. wide; endemic on San Diego Island*H. gracilenta*

Stems terete, shrubby if at all only near the base; mainly back from coast.

Plant densely hirtellous; flowers pubescent outside, in close cymes.....*H. peninsularis*

- Plant glabrous; flowers glabrous, in open cymes.
 Corolla 7-9 mm. long; sepals 1.5-2 mm. long; leaves short-petiolate, 1-2 mm. wide; stems usually simple, not glaucous.....*H. australis*
 Corolla 9-15 mm. long; sepals 0.5-1 mm. long; leaves sessile, 0.5-1 mm. wide; stems usually much branched, glaucous.....*H. brevipes*

388. *Mitracarpus linearis* Benth.

Mitracarpus linearis Benth., Bot. Sulph. 20. 1844.—*Type locality*: Cape San Lucas, Lower California.

Found on the mesa-like summits of the basaltic ridges which rise about the Isthmus on Espiritu Santo Island (3975). It was uncommon, growing in soil-filled crevices along with *Conobea intermedia*. While evidently referable to Bentham's species the specimens have shorter leaves and a more spreading habit than do other collections of the species. The atypical developments are probably ecologic in origin.

389. *Randia megacarpa* Brandg.

Randia megacarpa Brandg., Zoe 5:257. 1908.—*Type locality*: Comondú, Lower California.

To this species are referred the sterile, leafy branches collected in a cañon back of Agua Verde Bay (3896). The collection is from erect shrubs 18-27 dm. high that were frequent on steep talus slopes. Its leaves closely match those of the type in size and shape, but differ in having a slightly less dense pubescence. A very similar plant was seen on the cañon side in the Sierra Giganta back of Escondido Bay.

What is apparently the same plant was again collected near the Isthmus on Espiritu Santo Island (3982). There it grew in rocky places in the upper reaches of gulches and on the mesa-like ridge-crests. In the gulches it had several strict stems 9-15 dm. high, but on the ridges it formed a twiggy rough scraggly divaricately branched shrub only 6-9 dm. high. The fruit on the island plant became 25 mm. broad, which is slightly smaller than that (30 mm.) in the type of *R. megacarpa*. The type has fruit evidently 10-12 ribbed, whereas the fruit of the island plant is indistinctly ribbed. The fruit seems to persist on the plant for some time after the leaves are shed, and to be

more or less imperfectly equatorially circumscissile. Rodents appear to relish it. The flowers of this species have never been collected.

LXXXV. CUCURBITACEÆ

390. *Cucurbita cordata* Wats.

Cucurbita cordata Wats., Proc. Am. Acad. 24:50. 1889.—*Type locality*: Sandy plain near Los Angeles Bay, Lower California.

A single plant was found in a sandy wash at Agua Verde Bay (3902). The habit and fruit are those of *C. palmata*, the chief difference residing in its dissected leaves.

391. *Maximowiczia sonora* Wats.

Maximowiczia sonora Wats., Proc. Am. Acad. 24:51. 1889.—*Ibervillea sonora* Greene, Erythea 3:75. 1895.—*Type locality*: About Guaymas, Sonora.

The plants with the peculiar bottle-shaped epigeous roots which were observed at San Pedro and San Carlos bays are no doubt to be referred to this species. In its typical form the species is restricted to the mainland, ranging from middle western Sonora southward into Sinaloa. It is characterized by its long stems and dissected leaves. The leaves are twice three-parted with more or less lobed divisions.

392. *Maximowiczia sonora* var. *peninsularis*, n. var.

Leaves with broad lobes, these with broad irregular lobules or with the margin merely sinuate; stems very long, 2-4 m.

Type: No. 1307, Herb. Calif. Acad. Sci., collected June 6, 1921, by I. M. Johnston (no. 4026) on a sandy point just north of Gordas Point, Cerralbo Island, Gulf of California.

At the southern-most station on Cerralbo Island (4026), on a sandy point less than 1 km. north of Gordas Point, this plant vied with *Ferocactus diguetii* in the interest it aroused. It was very abundant, the sandy point being dotted with the weird large white epigeous roots. The body of the root, which is much depressed and seated in a shallow depression in the ground, averaged about 65 cm. in diameter but not infrequently

attains twice that measurement. From the body of the root there usually projects one, but not uncommonly two or three, coarse tapering necks which either stand erect or are bent over. The complete root averages 3-6 dm. high. Each neck produces one elongate main branch 3-4 m. long, as well as a few short branched stems 4-5 dm. long. At the time the plants were seen they were practically leafless. In looking over the colony one could not help but liken it to some out-of-place electrical development, the long bare trailing stems being the cables and the large white roots the huge insulators up through which the high tension current was conducted from the subterranean power station. The roots though exposed are unmolested by animals, no doubt due to the excruciatingly bitter taste. Goldman (Contr. U. S. Nat. Herb. 16:367, t. 133. 1916) has an excellent picture of a single plant, probably a member of the large colony described.

This variety includes all the plants collected in the cape region by Brandegee. At first it was made to include all the peninsular plants formerly referred to *M. sonora*, but which differ from the latter in having less-cut, more ample leaves. Brandegee (Univ. Calif. Pub. Bot. 6:361. 1916. and Proc. Calif. Acad. Sci. II, 3:139. 1891), however, has pointed out that the peninsular plants differ in cauline development, those of the cape region having stems 2-4 m. long whereas those further north have stems less than 1 m. long. The variety *peninsularis* is therefore defined so as to include only the long-stemmed plant of the cape region. The less robust and short-stemmed northern plant being the following variety.

393. *Maximowiczia sonora* var. *brevicaulis*, n. var.

Maximowiczia insularis Brandg., Univ. Calif. Pub. Bot. 6:361. 1916.—*Type locality*: Magdalena Bay, Lower California.

Sterile and usually leafless plants of this variety were noted at San Francisquito Bay (apparently the northern-most station), Escondido Bay, and Catalina, Santa Cruz, San Diego, San Josef, and Espiritu Santo islands. Brandegee (loc. cit.) reports it from Magdalena Bay, and Goldman (Contr. U. S. Nat. Herb. 16:367. 1916) has a collection from Pozo Alta-

mirano south of Calmalli. The plant has a bottle-shaped root 15 cm. in diameter and about 25 cm. high. The stems are less than 1 m. long. This variety may not be entirely distinct from *peninsularis*, but as it represents a tendency correlated with geography it seems worthy of some minor designation.

394. *Vaseyanthus insularis* (Wats.) Rose

Vaseyanthus insularis Rose, Contr. U. S. Nat. Herb. 5:120. 1897.—*Echinopepon insularis* Wats., Proc. Am. Acad. 24:51. 1889.—*Echinopepon palmeri* Wats., Proc. Am. Acad. 24:52. 1889.—*Brandegea palmeri* Rose, Contr. U. S. Nat. Herb. 5:120. 1897.—*Type locality*: San Pedro Martir Island.

In one or another of its several forms this cucurbit was common at nearly every station in the gulf area. It was most common in the cañons and on the slopes back from the beach where it climbed in tangled masses over the shrubbery and rocks, or festooned the trunks of the columnar cacti. It not infrequently, however, occurred along cobblestone beaches growing in such abundance as completely to cover large areas of rocks, thereby making walking in such areas not only difficult but dangerous. The whole plant, particularly the fruit, is extremely astringent.

All forms of the species are excessively variable in foliage, even in a single locality. At the type locality of the species, for example, the leaves vary from sparsely and inconspicuously strigose to very densely short-hirsute, from green to canescent, from thin to thick, from ample (5-7 cm. broad) to small (under 5 cm. broad), and from shallowly 5-lobed with broad triangular lobes to 5- or 7-cleft with oblong or lanceolate lobes. It is quite evident that foliage is too variable to furnish diagnostic characters. The plant is usually a long trailing vine, but occasionally it loses its viny habit and forms small self-supporting globose masses 3-6 dm. high, a development of habit similar to that characterizing the "Cupid" sweet peas. The floral structures seem quite constant.

The fruit consists of a globose body and a conical caducous hollow cap. The body consists of a single-seeded cell that is surrounded by an indurate wall strengthened by a tough vesicular layer. The surface of the body of the fruit is usually

covered with stiff, coarse spines, but it may be naked. At some localities, as the type locality of the species, all stages can be found between densely echinate fruit and that with few or no spines. At other stations, as on Nolasco and Tortuga islands, plants with naked fruit and plants with spiny fruit grow even intertwined and yet keep perfectly distinct. As the smooth-fruited plants occur only in the northern parts of the gulf, the geographical correlation seems to justify the treatment of them as at least varietally distinct. There is also a difference in the degree of spininess in the echinate forms. The more southern forms seem to have the longest and most abundant spines. These latter are here treated as constituting the variety *brandegei*. The plant of the middle gulf has spines less developed than in the variety *brandegei* and represents the typical form of the species. While there are several pronounced tendencies exhibited in fructal variation the presence of abundant intergrades makes it best that these be treated as varieties. All the described forms of *Vaseyanthus* are accordingly reduced to one species and two varieties.

In his synopsis of the *Echinopepon* allies, Rose (Contr. U. S. Nat. Herb. 5:114-121. 1897) has referred Watson's *E. palmeri* to the genus *Brandegea*. This step must have been based on a study of poor or meager material, for that species is most positively congeneric with the type (*V. rosei*) of the genus *Vaseyanthus*. The genus *Brandegea* is very different from *Echinopepon* and *Vaseyanthus*, differing in its persistent (nonarticulate and noncaducous) beak and in the thin-walled (not indurate vesicular) fruit. The fruit of *Vaseyanthus*, particularly of the smooth-fruited slightly asymmetrical variety *inermis*, superficially suggests that of *Brandegea*, but in fact it is structurally much closer to *Echinopepon*. From *Echinopepon*, *Vaseyanthus* is to be distinguished by its tall, unarmed, conic beak surmounting an indehiscent, (usually) single-seeded, vesicular-walled, globose fruit. *Echinopepon* has an elliptical, 2-celled, thin-walled fruit that dehisces irregularly near the summit or by the falling away of a broad shallow echinate calyptra.

Collections representing the moderately armed, typical form of the species are at hand from San Pedro Martir (3146,

4387), San Pedro Nolasco (3132), Pond (4241), San Esteban (3183), North San Lorenzo (4197, 4195), South San Lorenzo (3537), and Tortuga (3607) islands.

395. *Vaseyanthus insularis* var. *brandegei* (Cogn.), n. comb.

Echinocystis brandegei Cogn., Proc. Calif. Acad. Sci. II, 3:59. 1890.—*Vaseyanthus brandegei* Rose, Contr. U. S. Nat. Herb., 5:119. 1897.—*Vaseyanthus rosci* Cogn., Zoe 5:368, t. 11. 1891.—*Type locality*: Todos Santos, Lower California.

Collections referable to this variety were made on San Marcos Island (3626), San Nicolas Bay (3705), Monserrate Island (3871), Agua Verde Bay (3894), San Diego Island (3929), and San Francisco Island (3955, 3956). In the Brandege herbarium the variety is represented by collections from Espiritu Santo Island, La Paz, Guadalupe, and San José del Cabo.

396. *Vaseyanthus insularis* var. *inermis*, n. var.

As in the species, but fruit absolutely unarmed.

Type: No. 1308, Herb. Calif. Acad. Sci., collected April 22, 1921, by I. M. Johnston (no. 3224) on steep slopes on **Isla Partida, Gulf of California**.

Collections of this smooth-fruited northern form were made on San Pedro Nolasco (3131), San Pedro Martir (4386), Tortuga (3606), South San Lorenzo (3535), Partida (3224, 3231), San Esteban (3182), Angel de la Guarda (4223), and Mejia (3355, 3360) islands.

LXXXVI. CAMPANULACEÆ

397. *Lobelia laxiflora* H.B.K.

Lobelia laxiflora H.B.K., Nov. Gen. et Sp. 3:311. 1818.—*Type locality*: Between Quaxiniquilapa and Acaguisotla, Guerrero.

Found only in the large cañon in the Sierra Giganta back of Escondido Bay (4114) where it grows in wet seepage-crevices and along the stream-edge at an altitude of about 500 m. It is locally very common, forming rank herbaceous tufts 5-15 dm. high. The plants have broadly lanceolate leaves,

and as far as foliage is concerned, are best referred to the typical form of the species. Brandegee's collections from the cape region, over 200 km. south of Escondido Bay, have linear-lanceolate leaves and have been referred to the variety *angustifolia* (Proc. Calif. Acad. Sci. II, 3:149. 1891). All the peninsular material seems to have a close, very floriferous inflorescence with the pedicels strictly ascending instead of widely spreading as in much of the mainland material.

LXXXVII. COMPOSITÆ

398. *Brickellia brandegei* Robinson

Brickellia brandegei Robinson, Mem. Gray Herb. 1:106. 1917.—*Type locality*: La Paz, Lower California.

This plant, previously known only from the type collection made at La Paz, was collected in the area back of the pearl-culture plant on Espiritu Santo Island (4004). In a ravine, where sheltered, it became a loosely branched rounded shrub 1-2 m. high, but on the crests of some basaltic ridges, where it was seen most abundantly, it formed a very compact growth about 1 m. high. In all respects the collection remarkably matches the type. As far as similarity is concerned it might well be part of the type collection, for the specimens agree with the type even in their unkempt appearance and mature state of fruiting.

399. *Brickellia peninsularis* Brandg.

Brickellia peninsularis Brandg., Zoe 5:160. 1903.—*Type locality*: La Chuparosa, Lower California.

Collected at about 500 m. altitude in the Sierra Giganta back of Escondido Bay (4126), where a few shrubs, 9-12 dm. high, were noted on the side of a narrow cañon. This collection compares well with the series of specimens collected in the cape region by Brandegee. Most of the series, like the plant from Escondido Bay, has a more grayish pubescence and more conspicuously veined leaves than does the La Chuparosa collection which Brandegee has indicated as the type of his species. Up to the present time the species has been known only from the cape region.

400. *Eupatorium sagittatum* Gray

Eupatorium sagittatum Gray, Pl. Wright. 1:88. 1852.—
Type locality: "California"; probably from Sonora.

This plant is common at San Pedro Bay (4320) and frequent about San Carlos Bay (4382). It forms large, dense, very intricately branched, hedge-like masses 1-2 m. high on saline flats, where it commonly grows with *Suaeda* and *Maytenus*. The flowers are lilac.

401. *Hofmeisteria crassifolia* Wats.

Hofmeisteria crassifolia Wats., Proc. Am. Acad., 24:53. 1889. *Type locality*: High mountains about Guaymas, Sonora.

This species was found on San Pedro Nolasco Island (3142) growing in dense masses on sea-cliffs, at San Pedro Bay (4307) occurring on cliffs in a cañon near the ocean, and at Kino Point growing on a rocky promontory. The plant has a branched woody caudex covered with an abundance of brittle stems, and forms a dense rounded mass 7-25 cm. high. The lobes of the succulent leaves are terete and pallid. The stigmas are pink; the corolla is the same color or a shade lighter.

402. *Hofmeisteria fasciculata* (Benth.) Walp.

Hofmeisteria fasciculata Walp., Rep. 6:106. 1847.—
Helogyne fasciculata Benth., Bot. Sulph. 20. t. 14. 1844.—
Type locality: Magdalena Bay, Lower California.

Collections of this species were made at Los Angeles Bay (3456), Las Animas Bay (3493), San Francisquito Bay (3574), Tortuga Island (3600), Tepoca Bay (3303), Isla Partida (3221), and near the south end of Angel de la Guarda Island (4233). A collection from Carmen Island (3814) has the foliage of the species, but the pubescence of the variety *pubescens*. The plants from Tortuga Island grew on the walls of a volcanic crater, those from Los Angeles Bay on cañon-walls in hills back from the coast, but the remainder came from elevated beaches or cliffs facing the sea. The plant forms dense rounded clumps 2-6 dm. high. The flowers are very numerous and vary from flesh-colored to lilac. The leaves are green, flattened, and slightly succulent.

403. *Hofmeisteria fasciculata* var.
pubescens (Wats.) Robinson

Hofmeisteria fasciculata var. *pubescens* Robinson, Proc. Am. Acad. 47:192. 1911.—*Hofmeisteria pubescens* Wats., Proc. Am. Acad. 24:54. 1889.—*Type locality*: Mulegé, Lower California.

This variety ranges along the west side of the gulf from the vicinity of Mulegé southward at least to Catalina Island. It is characterized by its glandular-villous, succulent foliage. Collections were made at San Nicolas Bay (3714), Ildefonso Island (3744), Coronados Island (3765), Puerto Ballandra, Carmen Island (3814), and western shore of Catalina Island (3765). At all the stations it grew on elevated beaches or on cliffs facing the sea. It forms dense globose or hemispherical clumps 3-6 dm. high. Its stems, like those of the species, are excessively brittle. The old plants have a rather heavy woody caudex. The flowers are lilac.

404. *Hofmeisteria filifolia*, n. sp.

An herbaceous perennial forming dense rounded clumps 1-6 dm. high; stems commonly numerous, simple below, with a few strict branches above, striate, slender, densely stipitate-glandular; leaves numerous, alternate, 4-7 cm. long, 3-6 cm. wide, glandular, not at all fleshy, lower leaves palmately 3-parted or pinnately 5-parted the filiform or dilated lobes simple or 3-parted, upper leaves simply 3-parted with filiform spreading lobes; peduncles slender with scattered setaceous bracts, 5-9 cm. long; heads narrowly campanulate, 8 mm. high, 4-5 mm. wide, many-flowered, with numerous narrow acuminate bracts and naked receptacles; corolla pale pink, very narrow, 3.5-4 mm. long, lobes rounded and broader than long; pappus of 3 antrorsely barbed awns (these either shorter or longer than the corolla) and 3 alternating broad lacinate white paleae; achenes black, usually with 2 of the 5 angles strigose, callous-tipped below.

Type: No. 1309, Herb. Calif. Acad. Sci., collected May 3, 1921, by I. M. Johnston (no. 3418) from partially shaded rock-crevices in Palm Cañon, Angel de la Guarda Island, Gulf of California.

Three collections of this species were made. A colony of three plants was found on a lava cliff in a narrow cañon on Mejia islet (3364), and many plants were discovered growing in dense masses in crevices of sunny south-facing breccia cliffs in the rocky hills back of Puerto Refugio (3377). The plant was found to be most abundant along the walls of Palm Cañon (3418). These stations are all on or near Angel de la Guarda Island.

The new species is most closely related to *H. fasciculata*, but is distinguished from all phases of that polymorphous species by its more slender habit, smaller heads, shorter and rounded corolla-lobes, filiform non-succulent leaves, and pappus of 3 setæ and 3 laciniate paleæ. *Hofmeisteria fasciculata* is a much coarser, more juicy, plant and is less distinctly tufted than *H. filifolia*, and its leaves are never so narrow, nor so elongate.

405. *Hofmeisteria pluriseta* Gray

Hofmeisteria pluriseta Gray, Pacif. R. R. Rep. 4:96, t. 9. 1857.—*Type locality*: Cañon of the Williams River, Arizona.

Two typical collections of this species were made, one from a populous local colony growing on a north-facing lava cliff in the hills back of San Luis Gonzales Bay (3326), and the other from rock crevices in the cañons back of Puerto Refugio on Angel de la Guarda Island (3376). The latter collection seems to set the southern limit for the species. The plant forms an intricately-branched bush 3-6 dm. high. Brandegee has a collection from Santa Maria, but the other collections reported by him (Proc. Calif. Acad. Sci. II, 2:167. 1889) belong to the following varieties:

406. *Hofmeisteria pluriseta* var. *laphamioides* (Rose), n. comb.

Hofmeisteria laphamioides Rose, Contr. U. S. Nat. Herb. 1:79. 1890.—*Type locality*: Summit of San Pedro Martir Island.

This plant commonly grows on cliffs, forming rounded shrubby growths 3-6 dm. high. On San Pedro Martir Island it is most abundant in the cactus forest crowning the island and forms an erect-growing shrub 5-10 dm. high. The flowers are

pleasantly though not strongly fragrant. No soil preferences are shown by the plant, it being collected from lava, tufa, and gypsum. Collections were made on San Pedro Martir (3157, 3162), Sal si Puedes (3521), San Marcos (3630), and Tiburon (3266) islands. The characteristic foliage was recognized on Tortuga Island where it occurred on the crater-walls, on Carmen Island where infrequent on cliffs back of Puerto Ballandra, and on Pelican Island where it grew commonly in sheltered rock crevices. Palmer has collections from Santa Rosalia, and Brandege has material from San Ignacio and San Bartolomé Bay. The range of the variety is therefore the gulf islands and the peninsula between latitudes 26° and 29° N.

Hofmeisteria laphamioides can not be maintained as a distinct species, as it lacks decisive floral or foliar characters. A collection made at Las Animas Bay (3516), while nearest *laphamioides*, is intermediate between it and *pluriseta*. *Hofmeisteria pluriseta* usually has slender flexuous stems and small leaves, but the character of growth is not constant even in Californian specimens while the leaves vary so in size and form that no line can be drawn between the small leaves of *pluriseta* and the larger ones characteristic of *laphamioides*. The plate given by Gray shows leaves fully as large as those in the Las Animas Bay collection, the pictured foliage differing only in their more jagged toothing. It seems that *laphamioides* is only a geographical form of *pluriseta* occurring in the region immediately to the south of the latter.

407. *Hofmeisteria pluriseta* var. *pauciseta*, n. var.

Pappus setæ 5, alternated by 5 obtuse oblong scales.

Type: No. 1310, Herb. Calif. Acad. Sci., collected April 17, 1921, by I. M. Johnston (no. 3134) from a cliff on San Pedro Nolasco Island, Gulf of California.

Superficially, this variety seems identical with the variety *laphamioides*, but differs from that plant in conspicuous pappus developments. In *pluriseta* and the variety *laphamioides* the pappus consists of 5-15 setæ and usually 10 scales, whereas in the variety *pauciseta* there are but 5 setæ and 5 scales. The variety *pauciseta* is less evolved in its pappus developments than *pluriseta* and *laphamioides*, for these latter forms reveal

the consummation of a tendency for the scales to be deeply bifid or cleft and transmuted into bristles or awned scales. In *pauciseta* the scales are erose or truncate, but in *pluriseta* and *laphamioides* the scales are bifid or divided, producing awns from their sinuses and frequently from their apices as well. There appears to be an unequal development of this tendency to awn, as one side of the achene produces longer awns than the other.

The variety *pauciseta* was collected only on San Pedro Nolasco Island (3134) where it was frequent on sheltered cliffs and ledges near the sea. It formed dense rounded growths about 5 dm. high and 5-7 dm. broad. Rose (16868) collected it on Espiritu Santo Island, and Brandegee (Proc. Calif. Acad. Sci. II, 2:167. 1889) has a similar plant from Purisima. All three collections are along the southern limits of the variety *laphamioides*.

408. *Hofmeisteria tenuis* (Wats.), n. comb.

Malperia tenuis Wats., Proc. Am. Acad. 24:54. 1889.—
Type locality: Stony ridges near Los Angeles Bay, Lower California.

Collected at San Francisquito Bay (3563) where fairly common on a shell-covered ridge back from the bay, and on the south end of Angel de la Guarda Island (4205) where a few plants were seen on a silty flat. The island collection is diffusely branched, 38 cm. high and nearly as broad, and has three pappus bristles as described in the original diagnosis. The San Francisquito plants were eaten down, probably by rodents, and are low and spreading in consequence; dissection reveals that flowers with three or four pappus setae are borne in the same head. Brandegee has a collection from San José de Garcia (Proc. Calif. Acad. Sci. II, 2:167. 1889) that bears flowers with five pappus bristles. It is evident, therefore, that in this species no importance can be attached to the number of pappus setae.

The floral and fruit structures of this plant are evidently those of *Hofmeisteria*. Its claim for generic distinctness lies wholly in its annual habit and sessile linear leaves. When referred to *Hofmeisteria*, the diversity of foliage which it brings to that genus is no greater than that already existing

between *H. plurisetata* and *H. crassifolia*, while the diversity in habit, hardly more than a specific character, can be reconciled with analogous cases in *Brickellia*, *Stevia*, and *Eupatorium*. Malperia is practically unknown in the literature; hence little support can be drawn from precedent or usage. The genus may be judged on its intrinsic characters which seem insufficient for the maintaining of a monotypic genus.

Hofmeisteria tenuis is a near relative of *H. plurisetata*, nearer in fact than the latter species is to the others of the genus. The most satisfactory treatment seems to demand the recognition of three sections made up as follows:—EUHOFMEISTERIA, composed of *H. fasciculata*, *H. crassifolia*, *H. filifolia*; BRICKELLIOPSIS, with only *H. plurisetata*; and MALPERIA, also with a single species, namely, *H. tenuis*. The species may be distinguished by aid of the following key:

Heads cylindric in cymes or corymbs; bracts 18-25; peduncles usually short; loosely branched plants with entire or toothed leaves.

Plant annual; leaves sessile, entire, linear or lance-linear; §MALPERIA.....*H. tenuis*

Plant perennial; leaves petioled, crenate or toothed, with a broad blade; §BRICKELLIOPSIS.....*H. plurisetata*

Heads campanulate, solitary on long peduncles; bracts 50 or more, compactly branched plants with dissected or rarely crenate leaves; §EUHOFMEISTERIA.

Pappus setæ 5 or more; plant glabrous, glaucous; leaf-lobes terete.....*H. crassifolia*

Pappus setæ fewer than 5; plant more or less pubescent, never glaucous; leaf-lobes always flattened.

Setæ 2 (very rarely 3); paleæ oblong, entire; leaves somewhat fleshy, crenate to dissected, when dissected the lobes oblong; heads 1 cm. high; corolla-lobes triangular.....*H. fasciculata*

Setæ 3, paleæ lacinate; leaves not fleshy, divided into long filiform lobes; heads 8 mm. high; corolla lobes rounded.....*H. filifolia*

409. *Aplopappus spinulosus* var. *scabrellus* (Greene) Blake

Aplopappus spinulosus var. *scabrellus* Blake, Contr. U. S. Nat. Herb. 52:24. 1917.—*Eriocarpum scabrellum* Greene, Erythea 2:108. 1894.—*Type locality*: Los Angeles Bay, Lower California.

This is the peninsular variant of the widely distributed *A. spinulosus*. It comes only from the northern part of Lower California. Collections were made only on Angel de la Guarda Island (3378, 3417), but these compare well with material collected by Palmer at Los Angeles Bay, and by Brandegee at San Sebastian and San Enrique.

410. *Aplopappus arenarius* Benth.

Aplopappus arenarius Benth., Bot. Sulph. 24. 1844.—*Type locality*: Cape San Lucas, Lower California.

Collected on San Diego (3930), Santa Cruz (4096), Carmen (3817, 3854), and Coronados (3754) islands, where it grew on dunes or on slopes near the sea. It is a suffruticose plant with a few widely spreading branches. These specimens, like most of those collected away from the immediate vicinity of Cape San Lucas, have the leaves sharply serrate, frequently aristate, and comparatively narrower and thinner than do specimens taken at the cape. In general the specimens from the sea-shore about Cape San Lucas have the leaves broadly spatulate or oblanceolate and the toothing so shallow and remote that the general impression given is that of entire margins. These southern plants are covered with a short, stiffish, usually glandular pubescence which makes the foliage seem thicker than it is in fact. *Aplopappus arenarius* ranges over the southern two-thirds of the peninsula, and while related to *A. spinulosus*, is readily distinguished from that species by its bushy fruticose habit. *Aplopappus spinulosus* and its varieties at most have a short close prostrate caudex and erect herbaceous stems.

411. *Aplopappus arenarius* var. *incisifolius*, n. var.

As in the species, but leaves pinnately parted with remote narrow lobes.

Type: No. 1311, Herb. Calif. Acad. Sci., collected May 9, 1921, by I. M. Johnston (no. 3529) on a rocky bench on **South San Lorenzo Island, Gulf of California**.

An endemic, or at least an uncommon leaf-form of *A. arenarius*, characterized by its pinnately parted foliage. Seen

only on South San Lorenzo Island (3529) where quite conspicuous, growing abundantly on a gravel beach among plants of a cactus thicket and forming compact shrubby globular masses 15-60 cm. high. It is very abundantly floriferous. The leaves are sparsely glandular and have aristate lobes.

412. *Aplopappus arenarius* var. *rossii*, n. var.

Slender erect-growing plants 5-10 dm. high.

Type: No. 1312, Herb. Calif. Acad. Sci., collected May 12, 1921, by I. M. Johnston (no. 3627) on margin of a gypsum mesa on San Marcos Island, Gulf of California.

This plant grew on a gypsum mesa on San Marcos Island (3627). It has little resemblance to other forms of *A. arenarius*; in fact, suggests *A. juncea* in general contour and habit. It is referred to *arenarius* because of its branched bushy caudex. The plant is named for Captain John Ross, captain of the vessel chartered for the expedition.

413. *Ericameria diffusa* Benth.

Ericameria diffusa Benth., Bot. Sulph. 23. 1844.—*Solidago diffusa* Gray, Proc. Am. Acad. 5:159. 1861.—*Bigelovia diffusa* Gray, Proc. Am. Acad. 8:640. 1873.—*Chrysoma diffusa* Greene, Erythea 3:10. 1895.—*Linosyris sonoriensis* Gray, Proc. Am. Acad. 8:291. 1870.—*Aster sonoriensis* Kuntze, Rev. Gen. 1:317. 1891.—*Type locality*: Magdalena Bay, Lower California.

This is a very common plant in slightly alkaline ground at Los Angeles Bay and at Loreto (3777). It was noted in less abundance at Agua Verde Bay (4385), Escondido Bay, and La Paz. It occurred in abundance on San Marcos Island (4181), but the only other insular colony seen was that on the summit of Ildefonso Island (3748). It was frequent on the Sonoran coast about San Pedro and San Carlos (4384) bays. The plant forms a shrub 8-24 dm. high which is branched from the base and rather loose in growth. The leaves are resinous-glutinous.

414. *Aster spinosus* Benth.

Aster spinosus Benth., Pl. Hartw. 20. 1839.—*Leucosyris spinosa* Greene, Pittonia 3:244. 1897.—*Aster spinosus* var. *spinosissimus* Brandg., Univ. Calif. Pub. Bot. 6:375. 1917.—*Type locality*: To the north of Mexico City.

A very common and annoying plant in the large cañon in the Sierra Giganta back of Escondido Bay (4122). It grows in moist sand, apparently spreads by rhizomes, and forms dense spiny thickets 15-25 dm. high. The stems are strictly erect with many ascending pungent branches. The variety *spinosissimus* appears to be merely a coarse-stemmed form. Its occurrence is sporadic and its origin is probably ecologic. The collected material is not referable to it.

415. *Aster frutescens* Wats.

Aster frutescens Wats., Proc. Am. Acad. 24:55. 1889.—*Xylorrhiza frutescens* Greene, Pittonia 3:48. 1896.—*Type locality*: Stony ridges near Los Angeles Bay, Lower California.

A frequent plant on Angel de la Guarda Island (4224) and on the islets near its shore. It is particularly common on Pond Island (4238, 4242) where it grows on rocky hillsides and benches, forming very loosely and ascendingly branched shrubs 5-10 dm. high. The vegetative portions of the plant, which much suggest that of a *Hazardia*, were noted on Mejia islet and at Puerto Refugio. The rays are lilac. The relationship of the plant is clearly with those of the section *Megalastrum*, but it is quite distinct from all species of that group in its smaller heads, different habit, glandularity, and smaller strongly veined leaves. There is a suggestion about the plant of some of the coarser species of *Machaeranthera*.

416. *Baccharis sarothroides* Gray

Baccharis sarothroides Gray, Proc. Am. Acad. 17:211. 1882.—*Type locality*: Near Old Mission station, San Diego County, California.

Occasional in draws on San Pedro Martir Island (3159) where it forms a bright-green, compact shrub 12-15 dm. high.

It is reported (Proc. Am. Acad. 24:55. 1889) as growing only 6 dm. high on the island, but all plants seen there were considerably taller.

417. *Pelucha trifida* Wats.

Pelucha trifida Wats., Proc. Am. Acad. 24:55. 1889.—
Type locality: San Pedro Martir Island.

This plant, forming a well-marked monotypic genus, has until the present been known only through the collections made by Palmer on San Pedro Martir Island. During the expedition it was collected on San Pedro Martir Island (3151), at Palm Cañon on Angel de la Guarda Island (3412), and in a cañon back of Las Animas Bay (3508). It is definitely to be removed from the lists of insular endemics.

On San Pedro Martir Island the plant is very common in rocky ground along the crest of the island, growing most abundantly on those slopes most exposed to the sea breezes. It is an open, irregularly branched shrub 7-10 dm. high whose younger stems are white with a thin, rather easily removed, oily tomentum. The plant is strongly aromatic and scents its immediate neighborhood upon the slightest bruising. The odor is peculiar and hardly that of cloves and cinnamon as suggested by Vasey and Rose (Contr. U. S. Nat. Herb. 1:79. 1890). On Angel de la Guarda Island only a small colony of the plant was found, that occurring on a protected cliff in a cañon. At this locality the shrubs were scraggly and spreading, becoming only 6 dm. high. No flowers were obtainable. At Las Animas Bay the plant grew in crevices on a steep, rocky west-facing wall of a narrow cañon in the hills just south of the bay. It was locally common, forming a depressed, irregularly branched shrub 3-8 dm. high. The odor and other characters were identical with those of the plants at the type locality.

The flowers in *P. trifida* are essentially homogamous, but in some heads there appears to be a slight tendency for the peripheral (perfect) flowers to be zygomorphous. The corolla is glabrous within and oily-tomentose outside. The style-branches are very slender and glabrous, undivided or as much as 3 mm. long. The pappus-bristles are numerous, antrorsely

scabrous, and in 3 or 4 notably unequal series. The mature achene is about 3 mm. long, a little over 1 mm. wide, and covered with a dense white hispid-villous coat that contrasts with the dull color of the pappus. Under the pubescence the achenes are 10-11-ribbed. The species seems very constant in its floral development.

418. *Pluchea odorata* (L.) Cass.

Pluchea odorata Cass., Dict. Sci. Nat. 42:3. 1826.—*Conyza odorata* L., Syst. Nat. ed. 10, 2:1213. 1759.—*Type locality*: Jamaica.

Frequent on San Marcos Island (3632), where it grows in colonies about pools in gypsum ravines. It usually forms rank growths 12 dm. high, but occasionally becomes small trees 4 m. high. A native called it "conolon." A few plants were also noted at a stream-edge in the cañon back of Escondido Bay.

419. *Acanthambrosia bryantii* (Curran) Rydb.

Acanthambrosia bryantii Rydb., N. Am. Fl. 33:22. 1922.—*Franseria bryantii* Curran, Proc. Calif. Acad. Sci. II, 1:232. 1888.—*Type locality*: Vicinity of Magdalena Bay, Lower California.

At San Francisquito Bay (3548) this remarkable shrub was locally abundant on a sandy stretch of wash about 1 km. back from the ocean. It is a compact, rounded, light-green shrub 3-9 dm. high, and is notable because of its large burs. The burs are pallid and are strongly contrasted against the green of the herbage. They are persistent, adhering even to the dead wood within the plant. None was seen about the plants, so that their means of dissemination is obscure, especially as weevils seem to have attacked a large proportion of the persistent burs of previous seasons. The staminate flowers are borne in short, close racemes. With the exception of the San Francisquito Bay collection it is known in the gulf area only from a collection made by Rose on San Josef Island.

As to habit of growth, this plant is a *Franseria*, but as Rydberg has indicated, it has the technical bur-characters of

Ambrosia. The peculiar bur is anomalous in both genera and so there seems good reason for maintaining the plant, on grounds largely of convenience, as a monotypic genus.

420. *Franseria ambrosioides* Cav.

Franseria ambrosioides Cav., *Icones* 2:79, t. 200. 1793.—*Gærtneria ambrosioides* Kuntze, *Rev. Gen.* 1:339. 1891.—*Type locality*: Mexico.

A few plants were found on a sandy clearing at La Paz (3066). It grew as a viscid-glandular, shrubby perennial with ascending or widely spreading stems, and became 10-15 dm. high. Two small boys called it "chicura."

421. *Franseria arborescens* Brandg.

Franseria arborescens Brandg., *Zoe* 5:162. 1903.—*Franseria carduacea* Greene, *Leaflets* 2:156. 1911.—*Franseria sanctæ-gertrudis* Rydb. *N. Am. Fl.* 33:35. 1922.—*Type locality*: Ascension, Lower California.

Seen only in the large cañon in the Sierra Giganta back of Escondido Bay (4131). It is common at about 150 m. altitude, growing usually about large rocks where it forms either very rank tufts of subsimple stems, or produces one or two stems with ascending branches. It becomes nearly 3 m. tall and is distinctly woody.

422. *Franseria dumosa* Gray

Franseria dumosa Gray in *Frem.*, 2nd Rep. 316. 1845.—*Gærtneria dumosa* Kuntze, *Rev. Gen.* 1:339. 1891.—*Type locality*: Mohave Desert, California.

Frequent on the dunes at San Luis Gonzales Bay (3353) where, during the visit late in April, only a single plant was found in fruit.

423. *Franseria ilicifolia* Gray

Franseria ilicifolia Gray, *Proc. Am. Acad.* 11:77. 1876.—*Gærtneria ilicifolia* Kuntze, *Rev. Gen.* 1:339. 1891.—*Type locality*: Cantillas Cañon, Lower California.

Noted on South San Lorenzo, San Esteban (3204), and Angel de la Guarda (3361, 4219) islands. It was common in well-drained, gravelly soils, usually in washes, where the numerous spreading, subsimple, tufted stems formed depressed rounded growths 3-6 dm. high and 9-12 dm. broad. The gentlest wind causes the harsh stiff leaves to rub against each other and produce an almost constant grating sound.

424. *Hymenoclea pentalepis* Rydb.

Hymenoclea pentalepis Rydb., N. Am. Fl. 33:14. 1922.—
Type locality: Pima Cañon, Arizona.

Forming an intricate shrub 9-12 dm. high in sandy washes at Freshwater Bay on Tiburon Island (3249). The plant has the habit of *H. salsola*, but though the wings of the involucre are almost as large and as erose as in the common plant of the Mohave Desert, they are in a single series and not spirally alternate. *Hymenoclea monogyra* has been distinguished by its uniserial wings, but *H. pentalepis* makes it necessary to stress the smaller involucre and more slender erect leafy habit.

425. *Bebbia juncea* (Benth.) Greene

Bebbia juncea Greene, Bull. Calif. Acad. Sci. 1:180. 1885.—
Carphephorus junceus Benth., Bot. Sulph. 21. 1844.—*Type locality*: Magdalena Bay, Lower California.

Growing on Tiburon (3267), San Esteban (4380), Partida (3236), and Angel de la Guarda islands; and at Tepoca and San Luis Gonzales bays. It is a shrub 8-12 dm. high with a dense crown of intricately branched, nearly leafless stems. It affects rocky soil, usually in washes, but not infrequently, as on Isla Partida, it occurs on talus. The original description calls for leaves 25-50 mm. long, but the collected material, like most of the specimens from California, has leaves only about 25 mm. long. Brandegee has collected at Magdalena Island and Comondú specimens with leaves like those in the type. All peninsular plants have smooth stems.

426. *Bebbia juncea* var. *atriplicifolia* (Gray), n. comb.

Carphephorus atriplicifolia Gray, Proc. Am. Acad. 5:159. 1861.—*Bebbia atriplicifolia* Greene, Bull. Calif. Acad. Sci. 1:181. 1885.—*Type locality*: Cape San Lucas, Lower California.

In habit this form is somewhat different from its congener, for instead of forming globose masses, it forms dense, intricate, depressed, flat-topped growths 6-12 dm. high and 10-25 dm. broad which are either self-supporting or supported 1-2 m. above the ground by other shrubs up through which the plant has grown. The stems are quite brittle. The inflorescence projects from the main mass of the plant and on an average is more dense than in the species, the pedicels being usually much under 3 cm. and not so elongated as in *B. juncea*. Although the two forms seemed distinct in the field, a study of the material in the Brandege herbarium has seemed to substantiate Mr. Brandege's statements (Proc. Calif. Acad. Sci. II, 2:180. 1889, and *Zoe* 1:271. 1890) that the forms approach each other too closely. *Bebbia atriplicifolia* is accordingly reduced to varietal rank and is taken as the southern form with hastate or triangular leaves. The variety was seen at Agua Verde Bay (3900), San Diego Island (3926), at the Isthmus on Espiritu Santo Island (3963), and at all the stops on Ceralbo Island (4026, 4051, 4069). It usually grows in gravelly soils, but on San Diego Island occurred on a hillside. The variety appears to be not uncommon in the cape region and characteristic specimens have been taken as far north as Comondú.

427. *Coreocarpus arizonicus* (Gray) Blake

Coreocarpus arizonicus Blake, Proc. Am. Acad. 49:344. 1913.—*Leptosyne arizonica* Gray, Proc. Am. Acad. 17:218. 1882.—*Corcopsis arizonica* Hoffm. in E. & P., Nat. Pflanzenf., 4^s:243. 1890.—*Type locality*: Near Fort Lowell, Arizona.

On San Pedro Nolasco Island (3144) this species is frequent on rocky slopes and on cliffs near the sea and forms bushy growths 3-5 dm. high. The rays are white with several brownish lines. The plant collected is unquestionably one of the variants of *arizonicus*, as its simply pinnate leaves, pectinately-

margined achenes, and pallid rays indicate. It is, however, very much more slender than the Arizona plant and perhaps is referable to the variety *filiformis* (Blake, loc. cit.).

A peculiar form of this species was found at San Pedro Bay (4293) growing high up on a gravelly beach and forming depressed spreading masses 15-25 cm. high and 5-6 dm. broad. The floral and fruit characters are those of true *arizonicus* but not only are the plants different in habit, but the leaves are thicker, much shorter (20-35 mm. long), and have short oblong lobes. These differences may be due to the beach habitat.

428. *Coreocarpus dissectus* (Benth.) Blake

Coreocarpus dissectus Blake, Proc. Am. Acad. 49:344. 1913.—*Acoma dissecta* Benth., Bot. Sulph. 29, t. 17. 1844.—*Leptosyne dissecta* Gray, Syn. Fl. N. A. 1:301. 1884.—*Coreocarpus dissectus* var. *longilobus* Blake, Proc. Am. Acad. 49:345. 1913.—*Type locality*: Magdalena Bay, Lower California; not Cape San Lucas as given! See notes by Blake (Contr. Gray Herb. II, 52:56. 1917) and Brandege (Proc. Calif. Acad. Sci. II, 3:224. 1890).

Collected on San Marcos Island (3623) where common in gypsum soil in ravines and on talus at foot of cliffs, on Carmen Island (3829) where found only in shelter of cliffs, and on Danzante Island (3860) where common on bluffs facing the sea. It is a slender-stemmed shrub forming a rounded bush 3-6 dm. high.

429. *Encelia farinosa* var. *phenicodonta* (Blake), n. comb.

Encelia farinosa f. *phenicodonta* Blake, Proc. Am. Acad. 49:362. 1913.—*Type locality*: Near San Quentin, Lower California.

Flowering material of this variety was found only on Tiburon (3254) and Patos (3236) islands. Plants in a sterile condition, and hence not positively of this variety, were noted at Tepoca Bay and on Angel de la Guarda, Tortuga, and San Marcos islands. It is very abundant on Tortuga Island, giving a pallid tone to that lava island.

430. *Encelia palmeri* Vasey & Rose

Encelia palmeri Vasey & Rose, Proc. U. S. Nat. Mus. 11:535. 1889.—*Type locality*: Lagoon Head, Lower California.

Frequent in a sandy wash near La Paz (3062). It is a low shrub with ascending branches and becomes 6 dm. high. Called "mirasol" by small boys.

431. *Helianthus niveus* (Benth.) Brandg.

Helianthus niveus Brandg., Proc. Calif. Acad. Sci. II, 2:173. 1889.—*Encelia nivea* Benth., Bot. Sulph. 27. 1844.—*Viguiera nivea* Gray, Bot. Calif. 1:354. 1876.—*Helianthus dealbatus* Gray, Syn. Fl. N. A. 1:271. 1884.—*Viguiera sonora* Rose & Standley, Contr. U. S. Nat. Herb. 16:20, t. 16.1912.—*Type locality*: San Quentin, Lower California.

A very common and conspicuous plant on the dunes at Kino Point (4285), and at Willards Point on Tiburon Island (4247). It is a beautiful species with clean white strigose decumbent stems and very numerous yellow flowers. It forms a loose growth 3-6 dm. high. The species is not known from the east shore of the peninsula. Along the Sonoran coast it is known from the stations mentioned, and from collections made at Guaymas by Brandegee, from an unspecified locality by Pringle, and from one made by MacDougal somewhat back from the shore near the head of the gulf.

432. *Coulterella capitata* Vasey & Rose

Coulterella capitata Vasey & Rose, Contr. U. S. Nat. Herb. 1:71, t. 1. 1890.—*Type locality*: La Paz, Lower California.

For over 30 years this very distinct species has been represented in herbaria by only two collections. These were taken by Palmer and Brandegee from a small colony of the bush which grew on the beach just to the east of La Paz. According to Mr. Brandegee, this small type colony has been long since washed away by storm water. The plant can now, however, be reported from two new locations. It is very common on San Francisco Island (3950), and is present, but much less

common, on Espiritu Santo Island where it was observed at the Isthmus (3981) and again about Candeleros Bay.

The species seems to do best when growing close to the ocean, particularly on an old beach above the height of storm water. On Espiritu Santo Island a few plants were observed even on the high dividing ridge at an altitude of considerably over 300 m. The plant has numerous stems with loosely ascending or horizontal branches which form a flattened shrubby mass 3-9 dm. high and 6-11 dm. broad. All the plants seemed to have much dead wood. The very succulent opposite leaves are 2-4 mm. thick. They fall very readily when the green plant is handled, but appear to dry up and remain attached for some time if left undisturbed. The involucre is a juicy, accrescent, thickly 3-4 winged, calyx-like structure that is transparent, greenish-yellow in color, and turns a greenish-blue when bruised. It usually bears but a single flower, but in one case two achenes were found in a single involucre. The corolla-lobes are lemon-yellow, recurved, and about as long as the tube. The achenes remain enclosed by the receptacle and fall when the latter does after drying. The plants observed were covered with undisturbed clusters of dried involucre, so that it is apparent that the succulence of the involucre plays no part in the dissemination of the species. The whole plant has a very strong odor that much suggests that of *Dyssodia*.

433. *Verbesina oligocephala*, n. sp.

Small shrub 6-12 dm. high with few ascending opposite branches; younger twigs white tomentose, older stems grayish and tending to be lightly glaucous; leaves opposite, light green, scabrous, the minute pustulate bases of hairs commonly with a tiny mass of resin; blade ovate or lance-ovate, acute, 4-7 cm. long, base rounded or cuneate, narrowed into a winged petiole 5-8 mm. long; heads comparatively small, 2-4 in terminal corymbose cymes; inflorescence not conspicuous; peduncles rather slender, 4-11 mm. long, covered with short but copious hairs; involucre campanulate, 3-4 mm. high, 4.5-7.5 mm. wide, much surpassed by flowers; bracts biseriate, ovate-oblong, a dull mustard-color with rounded recurving green tips; rays orange-yellow, neutral, about 12, tube pubescent and 2-2.5 mm. long,

ligule oblong and 5.5-6 mm. long, achenes epappose; disk-flowers yellow, perfect, 20-30, tube about 1 mm. long, throat 4.5 mm. long, the lance-triangular lobes 1 mm. long; receptacle low convex; paleæ oblong-linear, acute, pubescent, deciduous, 6 mm. long, closely enfolding the disk-flowers whose color they simulate and whose length they exceed; style 2 mm. long, tips acute; immature achenes cuneate, flat, 4.5 mm. long, 1 mm. wide, silky with hairs longest and densest above, lateral edges acute; pappus of 2 ciliate awns, these nearly as long as achenes.

Type: No. 1313, Herb. Calif. Acad. Sci., collected May 26, 1921, by I. M. Johnston (no. 3899) on a rocky slope in the mountains back of **Agua Verde Bay, Lower California.**

This plant was collected on a steep rocky slope in a huge amphitheater-like cañon in the Sierra Giganta just south of Agua Verde Bay (3899). It is an erect growing, little-branched shrub about 1 m. high. Only a few plants were seen, and these, with one exception, were out of flower. The plant is most nearly allied to *V. palmeri* Wats. from Los Angeles Bay, but differs in habit, canescent twigs, smaller heads, and in its few-headed inflorescence hidden among the foliage. It evidently belongs to the section *Sonoricola* in the revision by Robinson and Greenman (*Proc. Am. Acad.* 34:542. 1899), but is atypical in its habit and in its small heads.

434. *Viguiera deltoidea* Gray

Viguiera deltoidea Gray, *Proc. Am. Acad.* 5:161. 1861.—
Type locality: Cape San Lucas, Lower California.

The typical form of this polymorphous species was collected at La Paz (3034), and on San Pedro Nolasco (3127) and San Esteban (4379) islands. At La Paz it grew on the low bluffs along the ocean and formed an open scraggly shrub 15 dm. high. On Nolasco Island it grew in narrow rocky draws forming very broad clumps 10-15 dm. high. The collection at La Paz and the mentioned (3127) collection from Nolasco match in leaf-shape and pubescence several of Brandegee's collections from the cape region. The San Esteban collection has smoother subentire and less pronouncedly veined leaves, and came from plants growing in an open wash. Similar to this last in foliage is collection number 3141, also gathered on

San Pedro Nolasco Island. The latter plant grew with number 3127, but appeared quite different in the field. The atypical form (3141) has smaller heads in closer corymbs, and leaves narrower, smoother and lighter in color.

435. *Viguiera deltoidea* var. *chenopodina* (Greene) Blake

Viguiera deltoidea var. *chenopodina* Blake, Contr. U. S. Nat. Herb. 54:91. 1918.—*Viguiera chenopodina* Greene, Leaflets 2:154. 1911.—*Viguiera microphylla* Vasey & Rose, Proc. U. S. Nat. Mus. 11:535. 1890.—*Type locality*: Between San Domingo and Matancita, Lower California.

This variety, characterized by its firm pallid leaves, appears to be the prevailing *Viguiera* over the middle portion of the peninsula. It was collected in a cañon back of Guadalupe Point (4154), from hills back of Agua Verde Bay (3898), and from Carmen Island (3826). Bryant collected it on San Josef Island in 1892. The plant affects gravelly washes forming large clumps 15 dm. high. *Viguiera microphylla* seems to be merely a form of *chenopodina* with somewhat smaller leaves.

436. *Palafoxia linearis* var. *leucophylla* (Gray), n. comb.

Palafoxia leucophylla Gray, Proc. Am. Acad. 8:291. 1870.—*Palafoxia arenaria* Brandg., Proc. Calif. Acad. Sci. II, 2:178. 1889.—*Type locality*: Carmen Island.

Typical collections of this variety were made at San Nicolas Bay (3716), San Pedro Bay (4322), San Francisquito Bay (3588), Loreto (3776), and Monserrate Island (3866). The plant grows on the sand along the ocean, forming dense bushy growths 4-9 dm. high. Gray gives the height of the plant as 10 ft., but that measurement is unquestionably incorrect. Brandegee's collections from Boca de Las Animas, La Paz, and Guadalupe, coupled with the expedition material above cited form a rather uniform series agreeing in shrubby habit, densely strigose obtuse linear leaves (about 25 mm. long), and near lack of glutinous indument. Forms intermediate between *P. linearis* and the variety *leucophylla* were collected at Las Animas Bay (3514) and on Tiburon Island (3264).

Palafoxia linearis differs from its variety in having lance-linear, usually non-strigose, acute leaves, annual or biennial

root, erect stems 2-5 dm. high, and by being covered and darkened by glands. These characters distinguish only the extremes, and furthermore are not always concomitant. The bushy habit of *leucophylla* seems merely a response to a longer growing season. The young plants of the variety are tufted and indistinguishable in habit from the species. The Las Animas Bay collection has the bushy habit of the variety, but is glandular throughout and though the leaves suggest *leucophylla* they are more elongate and less strigose than usual. The Tiburon Island plant grew in rounded bushy masses 6-9 dm. high, but has much elongated glutinous leaves that closely approach those of *linearis*. Obtuse strigose leaves are found on a simple-stemmed annual plant collected at Guaymas by Brandegee. Gray (Proc. Am. Acad. 19:31. 1883) reduced *P. leucophylla* outright, but it would seem better to retain it as a geographical variety, inasmuch as it becomes stable in its characters and entirely replaces *P. linearis* on the shores of the southern parts of the peninsula.

437. *Perityle aurea* Rose

Perityle aurea Rose, Contr. U. S. Nat. Herb. 1:84. 1890.—
Type locality: Santa Rosalia, Lower California.

Found only on San Marcos Island (3614) where it grows in small colonies about moist salt-incrusted area in deep ravines cut into gypsum. It occurs with *P. emoryi* and is usually much branched from the base, becoming 4 dm. high and nearly as broad. The flowers are light yellow. It has been previously known only from the original collections made at Santa Rosalia.

438. *Perityle californica* Benth.

Perityle californica Benth., Bot. Sulph. 23, t. 15. 1844.—
Perityle deltoidea Wats., Proc. Am. Acad. 24:57. 1889.—
Type locality: Magdalena Bay, Lower California.

Of this species a single plant was found growing among the poppies on an opium plantation at Mulegé (3677). *Perityle californica* and *P. deltoidea* are essentially the same. The former has slightly larger pappus squamulæ, but that is a small

difference and one frequently done away with by intergradation. Rydberg (N. Am. Fl. 34:13. 1914) separates the plants on their leaf-shape, a character even less satisfactory than the pappus difference. *Perityle deltoidea* was no doubt proposed because its author misapplied the name "*P. californica*" to forms of *P. emoryi*. He was certainly not attempting to segregate a critical species.

There are five yellow-flowered species of *Perityle* known from the peninsula. *P. californica*, *aurea*, and *lobata* are discussed and their synonymy indicated under separate headings. The others are *P. microglossa* and *P. cuneata*. *Perityle microglossa* Benth. (Bot. Sulph. 119. 1844) is a widely ranging species known on the peninsula only about San José del Cabo. It is characterized by its biaristate pappus, small heads, and short rays. *Perityle cuneata* Brandg. (Zoe 1:54. 1890) is as yet known only from the cape region and is characterized by its medium-sized heads and well developed rays. The pappus when present consists of short awns. *Perityle cuneata* stands in the same relation to *P. microglossa* that *P. robusta* does to *P. emoryi*. *Perityle marginata* Rydb. (N. Am. Fl. 34:14. 1914) differs from *cuneata* only in the broad callous margins of its achenes, and seems better named ***Perityle cuneata* var. *marginata*** (Rydb.), n. comb. It is apparently not uncommon at low altitudes in the southern parts of the cape region. The yellow-rayed peninsular species may be distinguished as follows:

Throat of disk-flowers much exceeding tube.....	<i>P. lobata</i>
Throat of disk-flowers about equalling tube.	
Awn one, equalling or exceeding the achene.	
Achenes callous-margined; leaves longer than broad....	<i>P. californica</i>
Achenes not callous-margined; leaves broader than long	<i>P. aurea</i>
Awns two or rarely none, usually unequal and shorter than achene.	
Head 3-5 mm. high, 4-6 mm. broad; rays 1-2 mm. long, inconspicuous.....	<i>P. microglossa</i>
Head 6-8 mm. high, 7-11 mm. broad; rays 3-5 mm. long, conspicuous.	
Achenes with narrow callous margin.....	<i>P. cuneata</i>
Achenes with very broad callous margin.....	<i>P. c. marginata</i>

439. *Perityle emoryi* Torr.

Perityle emoryi Torr. in Emory, Notes Mil. Recon. 142. 1848.—*Laphamia emoryi* Benth & Hook. in Jacks., Index Kew. 3:30. 1894.—*Perityle nuda* Torr., Pacif. R. R. Rep. 4:100. 1857.—*Perityle emoryi* var. *nuda* Gray, Bot. Calif. 1:397. 1876.—*Perityle californica* var. *nuda* Gray, Syn. Fl. N. A. 1:321. 1884.—*Laphamia nuda* Benth. & Hook. in Jacks., Index Kew. 3:30. 1894.—*Perityle fitchii* var. *palmeri* Gray, Syn. Fl. N. A. 1:321. 1884.—*Perityle grayi* Rose, Bot. Gaz. 15:118, t. 13, f. 8. 1890.—*Perityle greenei* Rose, Bot. Gaz. 15:117, t. 13, f. 7. 1890.—*Perityle emoryi* var. *orcuttii* Rose, Bot. Gaz. 15:117. 1890.—*Type locality*: Carrizo Creek, San Diego County, California.

Nine collections (3148, 3240, 3268, 3287, 3235, 3388, 3566, 3622, 4236) of this polymorphous species were made at various localities in the gulf area north of San Marcos Island. It was frequent, growing mainly back from the coast and on cliffs, in sandy draws, or about moist places. Though the species varies much in leaf-form and habit, segregation seems impractical. Intermediates are so numerous that the few typical representatives of a segregated variant are found to be lost among the host of atypical cognate forms. The important characters of *P. emoryi* are its medium-sized heads, white rather short inconspicuous rays, and villous- but not callous-margined achenes. The leaves may be suborbicular, ovate, or triangular-ovate in outline and have a base that is truncate, cordate, or reniform. The leaf margins are either coarsely toothed, or variously palmately lobed or cleft with the lobes crenate or serrate.

440. *Perityle lobata* (Rydb.), n. comb.

Leptopharynx lobata Rydb., N. Am. Fl. 34:23. 1914.—*Type locality*: Comondú, Lower California.

Rather common between 100 and 300 m. altitude in a deep cañon in the Sierra Giganta back of Escondido Bay (4115). The plant trailed over moist gravel on the cañon floor forming depressed growths 5-10 cm. high and 1-2 dm. broad. The leaf-blades are palmately cut with irregularly toothed lobes and are a trifle smaller than in the type, being scarcely 15 mm. long.

In duration the plant is definitely annual. Rydberg describes the species as "a low perennial, woody at the base," but all the type collection in the Brandegee herbarium is entirely herbaceous, and the one plant that shows the root is unmistakably annual. Neither Brandegee's Comondú nor Purisima collections (cf. Proc. Calif. Acad. Sci. II, 2:177. 1889, under *P. palmeri*) suggests the woody development and perennial habit characteristic of *P. palmeri*. *Perityle lobata* differs from its near relative, *palmeri*, in its herbaceous stems, green (not canescent) thinner and more deeply lobed leaves, and larger (3.5-5 instead of 3-3.5 mm. long) achenes whose sides are not glabrous but marked with conspicuous medial longitudinal lines of hairs.

441. *Perityle palmeri* Wats.

Perityle palmeri Wats., Proc. Am. Acad. 24:57. 1889.—*Leptopharynx palmeri* Rydb., N. Am. Fl. 34:23. 1914.—*Type locality*: Guaymas, Sonora.

Infrequent in shaded crevices on bare precipitous north-facing basalt cliffs at San Pedro Bay (4416) and on the ridge just east of Guaymas (3097). The plant has a thick woody root that grows tightly wedged in between the rocks.

442. *Perityle robusta* Rydb.

Perityle robusta Rydb., N. Am. Fl. 34:16. 1914.—*Perityle incompta* Brandg., Univ. Calif. Pub. Bot. 6:503. 1919.—*Type locality*: Ceralbo Island.

Collected at San Nicolas Bay (3720), Loreto (3791), Monserrate Island (3865), Agua Verde Bay (3893, Espiritu Santo Island (4081), La Paz (3030, 3068), and Ceralbo Island (4046). The plant grows in sandy soil usually somewhat back from the ocean and is commonly branched from the base and 15-50 cm. high. The species seems to be a near relative of *P. emoryi*, replacing it in the southern part of the peninsula, and differing from it in larger heads, long (about 5 mm.) conspicuous rays, and more deeply dissected leaves. The only suggestion of intergradation between *P. robusta* and *P. emoryi*, is that found in the plants collected on the sands at Guadalupe Point (4150). These are suggestive of *P. emoryi*, especially in their short rays. Also referred to *P. robusta* are collections

from San Francisco (3946) and Coronados (3756) islands. They grew on dunes and have coarse, indurated tap-roots, but can scarcely be perennial as they show no evidence of having flowered more than once. The leaves are thickish, more or less crisped, parted, glandular tomentose, and crowded near the base of the stem. This last form usually grew 25-50 cm. high, but on San Francisco Island some plants formed dense herbaceous masses 6-9 dm. high and 15 dm. broad.

443. *Perityle rotundifolia* (Benth.) Brandg.

Perityle rotundifolia Brandg., Zoe 4:210. 1893.—*Amauria rotundifolia* Benth., Bot., Sulph. 31. 1844.—*Perityle fitchii* Torr., Pacif. R. R. Rep. 4:100. 1857.—*Laphamia peninsularis* Greene, Bull. Calif. Acad. Sci. 1:8. 1884.—*Type locality*: San Quintin, Lower California.

A single large plant, 35 cm. high, was found growing on the bank of an irrigation ditch at Mulegé (3676). The plant was rounded in outline with the lower branches decumbent and the herbage somewhat glutinous. The achenes are quadrangular, with the faces smooth and shiny but the angles hairy. *Perityle rotundifolia* is akin to *P. brandegeana* Rose (Bot. Gaz. 15:114. 1890), but the latter apparently can be recognized through its slightly smaller heads and by the stout curved hairs covering the faces of the achenes.

444. *Trichoptilium incisum* Gray

Trichoptilium incisum Gray in Torr., Bot. Mex. Bound. 97. 1859.—*Psathyrotes incisa* Gray, Mem. Am. Acad. II, 5:322. 1854.—*Type locality*: Colorado Desert near Colorado River, California.

A few plants were gathered in a sandy wash back of San Francisquito Bay (3581).

445. *Dyssodia speciosa* Gray

Dyssodia speciosa Gray, Proc. Am. Acad. 5:163. 1861.—*Labetina speciosa* Nelson, Bot. Gaz. 47:435. 1909.—*Clo-menocoma speciosa* Rydb., N. Am. Fl. 34:165. 1915.—*Type locality*: Cape San Lucas, Lower California.

Collected at La Paz (3058) where previously taken by Brandegee and Palmer, and at the Isthmus on Espiritu Santo Island (3966). It is a weak shrubby perennial that clammers up through larger shrubs and forms dense intricate masses 3-9 dm. broad. It is a very striking plant when in flower.

446. *Nicolletia trifida* Rydb.

Nicolletia trifida Rydb., N. Am. Fl. 34:180. 1915.—*Type locality*: Los Angeles Bay, Lower California.

This is an interesting and conspicuous plant known only from the mid-section of the peninsula. It was collected at San Luis Gonzales Bay (3333), San Francisquito Bay (3562), and on Santa Inez Island where only a single plant was found. It affects sandy soil and spreads by deep rhizomes, so that when present it usually occurs in some abundance. The rays are white above, but outside they are marked by a broad medial longitudinal reddish-brown stripe. When bruised the plant exhales a strong *Dyssodia*-like odor that is entirely lost in drying.

447. *Porophyllum confertum* Greene

Porophyllum confertum Greene, Leaflets 2:155. 1911.—*Porophyllum ochroleucum* Rydb., N. Am. Fl. 34:189. 1916.—*Type locality*: Ceralbo Island.

Collected at the type locality which is situated just north of Gordas Point on the western shore of Ceralbo Island (4024). It was common there in gravelly washes, forming a slender shrub 15-25 dm. high. The plant has a rather strictly and little branched corymbose crown that is supported by a simple slender trunk-like stem. The corollas are a pale dilute yellow.

Also referred to *P. confertum* is the peninsular plant that has been frequently collected in the cape region, and of which Rydberg has segregated the broad leaved form as *P. ochroleucum*. The material from Ceralbo Island has an inflorescence slightly more crowded than that found in specimens from San

José del Cabo, but otherwise they seem quite similar. In its typical phases *P. confertum* may be recognized by its yellow corollas with lobes $1/3 - 1/4$ as long as the tube, by its narrow heads with involucre bracts less than 1 cm. high, and by its tall (over 1 m.) erect bushy habit of growth. Its nearest relative is *P. gracile* which is a lower and more bushy plant with broader heads composed of longer (over 1 cm.) broader involucre bracts, and brownish-stained pallid flowers with lobes $1/6 - 1/10$ as long as the tube. In *confertum* the main stem is long and simple, being terminated by a corymbosely branched crown, whereas in *gracile* the plant is bushy, the branching being from the base.

Porophyllum confertum as represented by extreme specimens, appears quite distinct from *P. gracile*, but its plea for specific distinctness is much clouded by several perplexing collections. In one made at Arroyo Salada (*Purpus* 233) the habit is correct, but the heads are a little large and, though the inner florets have lobes $1/4 - 1/5$ the length of the tube, the outer florets have lobes a little less than $1/7$ mm. as long as the tube. In a Brandegee collection from Sierra Laguna every thing is typical of *P. confertum* except that the flowers have lobes only $1/9$ as long as the tube. To include the latter collection in *P. confertum* would be to destroy the diagnostic value of corolla-proportion, the only crucial character of quantitative nature. Further collecting will probably reveal *P. confertum* confluent with *P. gracile*, inasmuch as the latter occurs in the region immediately to the north of that occupied by the former. Brandegee (*Zoe* 1:313. 1890) says that the cape plant differs from *gracile* in the possession of a pleasing fragrance.

There are two leaf-forms in *P. confertum*. The Ceralbo Island plant has its leaves linear-filiform and about 2 mm. broad. The same leaf-shape occurs on the peninsula as does also a broader form 4 mm. wide. The broad-leaved form would best be called **Porophyllum confertum** var. **ochroleucum** (Rydb.), n. comb. *Porophyllum ochroleucum* was based on a collection made at Saucito by Brandegee. It has yellow corollas with lobes $1/6 - 1/7$ as long as the tube. Though its heads

appear to be a little large for good *confertum* the growth habit seems to be typical. It represents one of the intermediates between *P. confertum* and *P. gracile*, but for the present can be made to include broad-leaved forms of *confertum*.

448. *Porophyllum gracile* Benth.

Porophyllum gracile Benth., Bot. Sulph. 29. 1844.—*Type locality*: Magdalena Bay, Lower California.

Not uncommon in gravelly washes in the gulf area. Collections were made on Angel de la Guarda Island (3414, 4211), Las Animas Bay (3520), San Marcos Island (3615), San Nicolas Bay (3735), Kino Point (4415), Tiburon Island (4256), and Tepoca Bay (3300). It is occasionally tufted with 4-5 stems, but commonly it is a bush under 6 dm. high. Occasionally it becomes as much as 12 dm. high. The Tepoca Bay collection presents the only notable variation. It has very long (over 9 mm.) corollas that protrude far from the involucre and have lobes $1/4$ - $1/5$ as long as the tube. This variant is probably to be referred to one of Greene's many segregates.

449. *Porophyllum leptophyllum*, n. sp.

A compact bushy shrub 15-60 cm. high with a very twiggy cinerescens woody framework and very slender siccousanguine foliage-bearing peripheral branches; leaves sessile, coriaceous, green, linear, 5-12 mm. long, 1-1.5 mm. wide, gland-tipped, acuminate, not crowded; heads terminating short leafy branches, 7-8 mm. high, 5-6 mm. broad, 25-30-flowered; involucre bracts 5, usually colored, oblong or obovate, each with a single gland or rarely with several glands near the apex; corolla entirely yellowish or at times with purplish lobes, 4.5-5.5 mm. long, lobes ovate and less than 0.5 mm. long; pappus of 5 groups of slender unequal antrorsely barbed bristles that are a trifle shorter or longer than the corollas; achenes glabrous, 2.5 mm. long, about 0.5 mm. wide, 4-angled with faces 3-4 grooved.

Type: No. 1314, Herb. Calif. Acad. Sci., collected May 1, 1921, by I. M. Johnston (no. 3373) in the low hills back of Puerto Refugio, Angel de la Guarda Island, Gulf of California.

Collected on Angel de la Guarda (3373), San Esteban (3168), South San Lorenzo (3533), and Tiburon (4250) islands. Brandegee has collected it at Paso de las Dolores. The plant grows on dry rocky cliffs or on packed gravelly beaches near the sea. It forms compact globose masses 1-3 or 6 dm. high, composed of stiffish twiggy intricately branched stems. It is decidedly shrubby and very woody at the base, differing in these regards from its relative *P. crassifolium*. The twigs are the color of dried blood and give the plant a very dark tone when viewed from a distance. The plant has a strong and peculiar odor that is entirely lost in drying. The new species is most nearly related to *P. crassifolium*. It is readily recognized by its linear, nearly terete, coriaceous leaves, its stiffish twiggy blood-colored woody stems, and its fewer less crowded, somewhat smaller heads. The range of *leptophyllum* is to the north of that of *crassifolium*.

450. *Porophyllum tridentatum* var.
crassifolium (Wats.), n. comb.

Porophyllum crassifolium Wats., Proc. Am. Acad. 24:57. 1889.—*Type locality*: Mulegé, Lower California.

Growing in crevices on bluffs near the sea or on dry packed elevated beaches forming a very close globose mass 1.5-5 dm. high. The plant has very juicy herbage and is strongly aromatic with a characteristic *Dyssodia*-like odor. It was collected only on Carmen (3815) and Monserrate (3870) islands. The plant differs from *P. tridentata*, of the western shore of the peninsula, only in its leaves which are simply acute and not 3-toothed. The species are very closely related, both, for instance, having the peculiar glandular apiculation on the leaf-tips, both having a similar habit and habitats, and both having the same floral developments. The relations are so obvious that a mere unit leaf-difference does not seem sufficient reason for keeping them distinct.

451. *Peucephyllum schottii* var. *latisetum*, n. var.

Bristles of inner pappus series all broadly scarious-margined, margins 3 or more times as broad as the midrib.

Type: No. 1315, Herb. Calif. Acad. Sci., collected May 12, 1921, by I. M. Johnston (no. 3644) on talus footing gypsum cliffs on San Marcos Island, Gulf of California.

This variety is a geographical form, differing from the species in the possession of broadly margined inner pappus bristles. The plants of California have the bristles of inner pappus series inconspicuously winged, but the peninsular plants have the bristles so broadly margined that attention is at once directed to them. Plants intermediate in pappus development occur in the region along the International Boundary. The type of the species has very narrowly margined setæ. The variety ranges southward along the eastern peninsular coast to about lat. 27° N., it was collected on San Marcos Island (3349) and Palmer (cf. Contr. U. S. Nat. Herb. 1:84. 1890) has material from Santa Rosalia. Brandegee and Goldman (Contr. U. S. Nat. Herb. 16:369. 1916) have made collections at Calamujuet. Other collections were made at San Luis Gonzales Bay (3349), Angel de la Guarda Island (3375), and San Esteban Island (3170). On San Marcos Island the shrub was common and usually grew on talus footing gypsum cliffs, but at the other stations it occurred as isolated bushes or formed small colonies always on volcanic rock. It was not collected on South San Lorenzo Island, but it is one of the most common shrubs there, frequently forming dense colonies and making green large areas on the brown rocky slopes. The plant is a resinous shrub 1-2 m. high with an open crown formed of many strictly ascending branches. A native on San Marcos Island called it "romero", and was very positive regarding its value in the treatment of female ailments.

452. *Psathyrotes ramosissima* (Torr.) Gray

Psathyrotes ramosissima Gray, Proc. Am. Acad. 7:363. 1868.—*Tetradymia ramosissima* Torr. in Emory, Notes Mil.

Recon. 145. 1848.—*Type locality*: Hills bordering the Gila River, Arizona.

Infrequent in a broad gravelly wash back of San Luis Gonzales Bay (3340). It has prostrate branches and forms mats 2-5 cm. high and 1-5 dm. broad. The herbage is glutinous due to the heavy oily nature of the tomentum. The odor of the plant is very strong and disagreeable, being almost exactly that of *Trichostema lanceolata*. This sets the southern limit for the species, the most southern previous collection being Brandegee's from Agua Dulce.

453. *Gochnatia arborescens* Brandg.

Gochnatia arborescens Brandg., *Zoe* 5:163. 1903.—*Type locality*: Cañon de Santa Maria, Lower California.

Near the south end of Ceralbo Island (4023) this species forms a close populous colony in a small draw near the head of a steep rocky cañon. The plants were arborescent with dark furrowed bark and an open crown. They were conspicuous when seen, due to the multitude of straw-colored glomerules which were borne on the leafless or nearly leafless branches. The leaves appear to drop soon after anthesis.

454. *Trixis californica* Kell.

Trixis californica Kell., *Proc. Calif. Acad. Sci.* 2:182, f. 53. 1862.—*Trixis suffruticosa* Wats., *Bot. Calif.* 2:459. 1880.—*Trixis angustifolia* var. *latiuscula* Gray, *Syn. Fl. N. A.* 1:410. 1878.—*Type locality*: Cedros Island.

Collected at Los Angeles Bay (3443), and on San Pedro Nolasco (3149), Patos (3246), and Tiburon (3270) islands. It was observed on San Esteban, Angel de la Guarda, and Tortuga islands. The plant usually grows in rocky places, forming low open shrubs 5-9 dm. high. This western plant differs from *T. angustifolia* of central Mexico only in the lack of tomentum on the lower leaf faces. Some of the plants in the cape region show a tendency to become tomentose, and it may be better to apply Gray's varietal name to our plant.

455. *Malacothrix xanti* Gray

Malacothrix xanti Gray, Proc. Am. Acad. 9:213. 1874.—
Type locality: Cape San Lucas, Lower California.

A large colony was found growing on a hot dry shell beach at La Paz (3031), but only a few plants were found fit for collecting. The material is in good fruit, and instead of having the achenes castaneous as described by Gray, they are decided yellow. The species is apparently a very distinct one with *M. fendleri* as its nearest relative. It is readily distinguished from *fendleri* by its larger, thinner leaves, taller, naked stems, yellow achenes with 2-3 outer pappus-bristles, and pink or rose-colored ligules. The achenes of the two species are almost identical in form, size, and markings.

456. *Stephanomeria exigua* Nutt.

Stephanomeria exigua Nutt., Trans. Am. Philos. Soc. II, 7:428. 1841.—*Ptiloria exigua* Greene, Pittonia 2:132. 1890.—
Type locality: "On the Rocky Mountain plains, toward the Colorado."

Scrambling up through bushes at Tepoca Bay (3295). The achenes have 4 ranks of smaller and more irregular tubercles than usually found on the faces of the fruit in this species, and the pappus-bristles are darker and longer-plumose than ordinary. The branches were numerous and very brittle.

APPENDIX

FUNGI AND LICHENS

Woody and leathery fungi were collected at every opportunity during the course of the Expedition. The few specimens collected were determined by Mr. C. G. Lloyd.

Lichens were taken at only a few localities, and then with no attempt at thorough collecting. The few conspicuous species collected have been authoritatively determined by Dr. E. A. Vainio.

Previous to the present list the only papers dealing with the peninsula fungus-flora were those by Patouillard & Hariot (*Jour. de Bot.* 10: 250-252. 1896), and by Harkness (*Proc. Calif. Acad. Sci.* II, 2:231-232. 1889).

The longest paper on the peninsular lichens is by Hue (*Jour. de Bot.* 9: 108-113. 1895). Hasse (*Contr. U. S. Nat. Herb.*, 17:1-132. 1913) and Eckfeldt (*Contr. U. S. Nat. Herb.* 1: 291-292. 1893), however, give scattering record concerning the peninsular lichen-flora.

FUNGI

1. *Tylostoma occidentale* Lloyd

Two plants were collected from a gravelly hillside at Ensenada Blanca on Monserrate Island (107).

2. *Schizostoma laceratum* Ehrenb.

A single specimen was collected on the dunes at San Nicolas Bay (117). Lloyd (*Mycolog. Notes* 7: 1173. 1923) has given a long discussion of this species, and a photograph of the San Nicolas collection. The latter is said to be the first made outside of equatorial Africa.

3. *Gyrophragmium inquinans* Berk.

A colony of this plant was found in sandy soil under *Prosopis chilensis* at the south end of Tiburon Island (115).

4. *Podaxon farlowii* Masse

Collected at the north (110) and south (116) ends of Angel de la Guarda Island and on Sal si Puedes Island (111). The plant was rare, only a few plants being seen at each locality. It affected gravelly soil.

5. *Battarrea digueti* Pat. & Har.

Growing in populous colonies in sandy soil, in most instances under *Prosopis chilensis*. Seen only at Escondido Bay (109), San Josef Island (114), and Carmen Island (113). The type was collected by Diguet somewhere in Lower California. Lloyd (Mycol. Notes 7: 1174. 1923) has commented on the Academy collections of the species and has given photographs of them. A small form of the species, collected in sandy soil under *Prosopis* at the south end of Tiburon Island (112), has been described by Lloyd (loc. cit., 1175, fig. 2335) as forma *minor*.

6. *Calvatia occidentalis* Lloyd

A few plants of this species were found on a gravelly cañon floor in the hills back of Marquer Bay, Carmen Island (106).

7. *Fomes rimosa* Berk.

Infrequent on sickly trees of *Lysiloma candida* at Marquer Bay on Carmen Island (105), and at San Carlos Bay, Sonora (100).

8. *Fomes robustus* Karst.

Found growing on living *Lysiloma candida* at Puerto Ballandra on Carmen Island (108).

9. *Polyporus curtisii* Berk.

Collected from *Bursera* at Amortajada Bay on San Josef Island (103), and from *Lysiloma* at Puerto Ballandra on Carmen Island (104).

10. *Polyporus hispidus* Bagl.

Denuded specimens were collected from an old willow stump in the bottom-land at Mulegé (101).

11. *Polyporus*, sp.

A polypore, collected with the last species from a willow stump at Mulegé (102) has no spores or pores developed. Concerning the plant Mr. Lloyd remarks, "It is anomalous, but I judge from context appearance that it is *Polyporus patouillardii* Rich."

LICHENS

12. *Buellia subalbula* (Nyl.) Muell. Arg. f. *dissolens* Vain.
Tortuga Island on basalt.

13. *Omphalaria lecideoides* Vain.
Tortuga Island on basalt.

14. *Physcia integrata* (Nyl.) Vain.
Tortuga Island on basalt.

15. *Physcia integrata* (Nyl.) Vain. f. *pallescens* Vain.
Tortuga Island on basalt.

16. *Placodium murorum* (Hoffm.) DC.
Tortuga Island on basalt.

17. *Placodium murorum* (Hoffm.) DC. f.
lobulata (Sommerf.) Vain.
Tortuga Island on basalt.

18. *Placodium murorum* (Hoffm.) DC. f. *vitellina* Vain.

Forming very conspicuous reddish patches on the rocks of Patos Island.

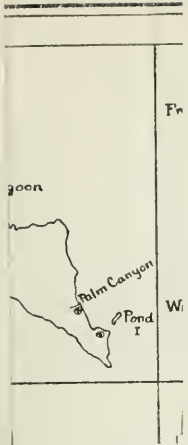
19. *Ramalina complanata* (Sw.) Ach.

Sheltered rocky cliffs on San Pedro Nolasco Island.

20. *Roccella montagnei* Bél.

On rocks and on the bark of *Colubrina glabra* on San Pedro Nolasco Island.

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Granite I.

Angel de la Guardia I.

Patos I.

St. Smiths I.

Pond I.

Tiburon I.

Angeles Bay

Los Animas Bay

Sol St. Puentes I.

N. San Lorenzo I.

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San Francisco Bay

Santa Teresa Bay

San Pedro Martir I.

San Pedro Bay

San Pedro Nolasco I.

San Carlos Bay

GUAYMAS

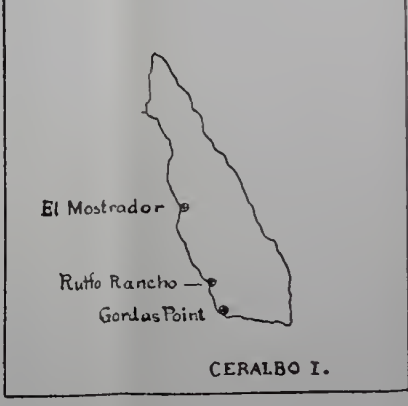
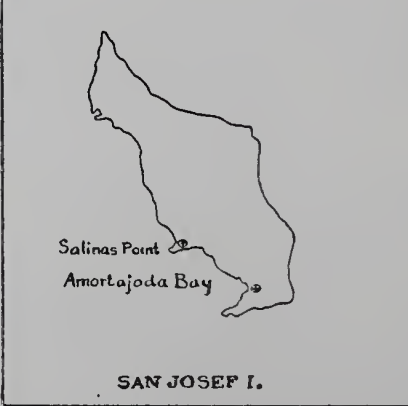
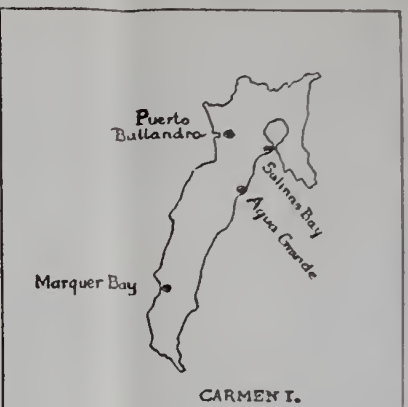
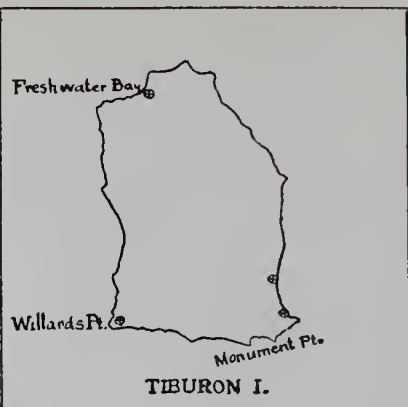
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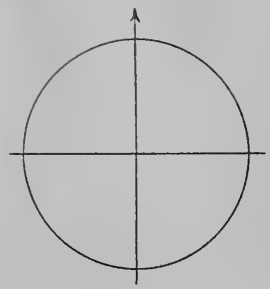
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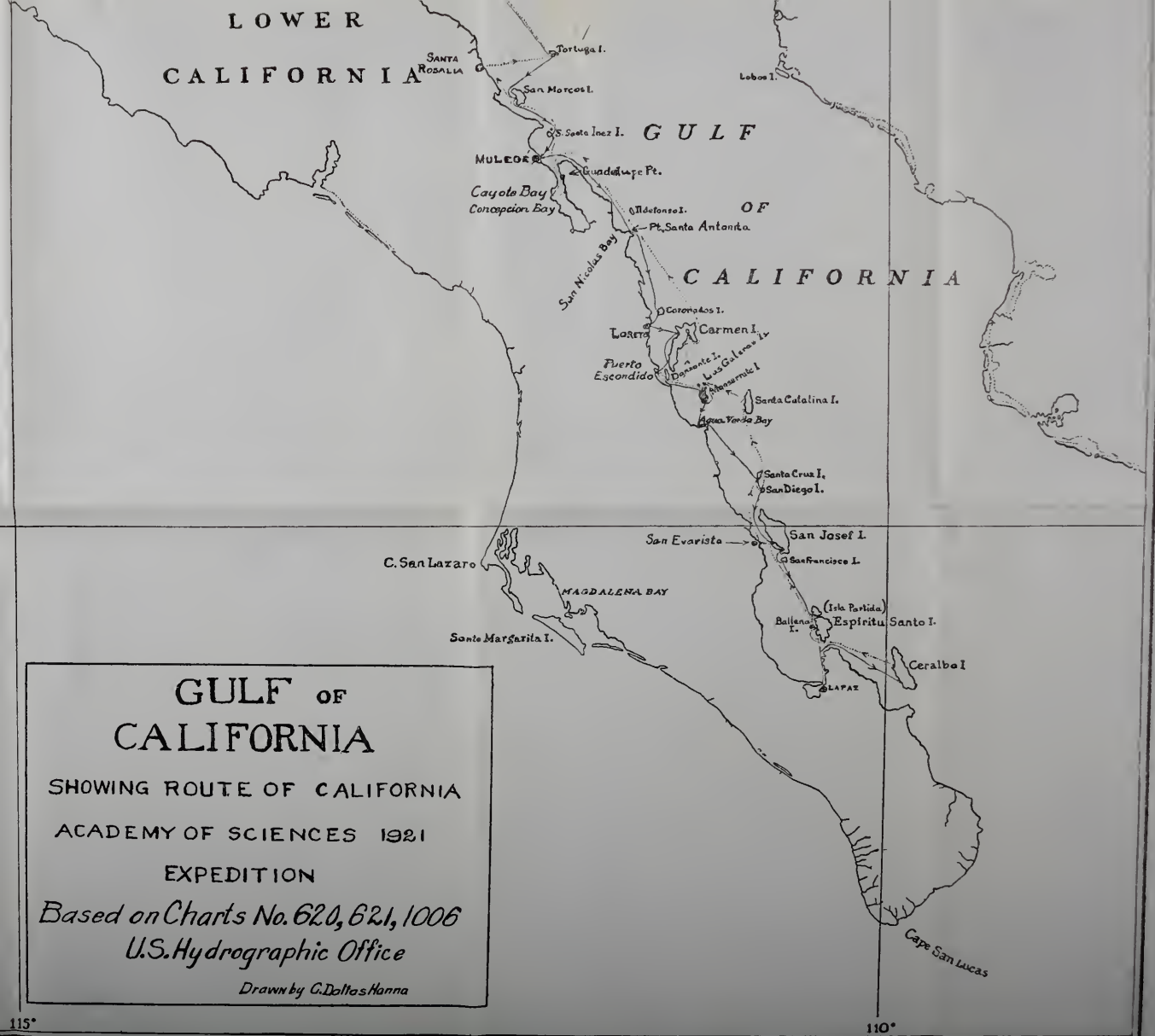
GULF

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GULF OF CALIFORNIA
SHOWING ROUTE OF CALIFORNIA
ACADEMY OF SCIENCES 1921
EXPEDITION
Based on Charts No. 620, 621, 1006
U.S. Hydrographic Office
Drawn by G. Dallas Hanna

115°

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PROCEEDINGS
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FOURTH SERIES

VOL. XII, No. 31, pp. 1219-1222, text-figures 1-3 JULY 22, 1924

XXXI

**EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹**

A NEW MOUSE (*PEROMYSCUS SLEVINI*) FROM
THE GULF OF CALIFORNIA

BY

JOSEPH MAILLIARD

Curator, Department of Ornithology and Mammalogy

While there is in the United States National Museum at Washington, D. C., a large series of specimens of mice of the genus *Peromyscus* from the coastal regions and islands of the Gulf of California, that region had not been completely worked over when the California Academy of Sciences sent an expedition to the Gulf in 1921. It was planned that during this expedition, rodents were to be obtained, if possible, from every island of any size in the Gulf, but, unfortunately, on account of the indisposition of that member of the party who represented the Academy's Department of Mammalogy, little work of this sort was accomplished. Among the few specimens of rodents secured, however, was a mouse which appears to be of a new species, taken on Santa Catalina, a small island two or three miles wide and eight or nine miles long, 17 miles northeast of Cape San Marcial.

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

July 22, 1924

As the collections at hand do not contain sufficient material for proper comparison, this specimen was sent to Dr. E. W. Nelson, Chief of the United States Biological Survey, Washington, D. C., with a request for a diagnosis. Dr. Nelson at once became interested in the matter and turned over the specimen for critical examination to Major E. A. Goldman, who agreed that this mouse was specifically different from anything so far described. Dr. Nelson writes: "The specimen, an adult male, has been examined by Major E. A. Goldman, who reports that, as you had anticipated, it is undescribed. It belongs to the subgenus *Haplomyomys* and is most closely allied to *Peromyscus californicus*, but differs so decidedly that he regards it as specifically distinct. . . . While additional specimens are, of course, very desirable, the characters presented by the specimen you forwarded are so well marked that it may safely be assumed to represent a new species, . . ."

Major Goldman also wrote: ". . . it seems to me one of the most interesting finds that have been made on any of the islands, as the species appears to be related to *Peromyscus californicus*, which is not known to occur anywhere south of the San Pedro Martir Mountains in Lower California. Collections have been made on many of the islands and the races of *Peromyscus* found to occur were in all cases either *Peromyscus maniculatus* or *Peromyscus eremicus* groups."

The singular part of this is that the San Pedro Martir Mountains, the most southern habitat of *Peromyscus californicus*, as mentioned above, are nearly 250 miles north of Santa Catalina Island. No examples of the *californicus* group have ever been taken on the mainland of Mexico proper.

The description of this specimen, as given below, is largely compiled from Major Goldman's report, as sent to me by Dr. Nelson, and I take advantage of the opportunity to thank these two gentlemen for the assistance which they have so cordially given to me in this and other cases.

On account of the interest shown in matters pertaining to the Department of Mammalogy, and the frequent assistance in the matter of collecting specimens so willingly given by Mr. Joseph R. Slevin, Assistant Curator of the Department of Herpetology, it gives me pleasure to name this new species

Peromyscus slevini Mailliard, new speciesSubgenus *Haplomylomys*

(Text-figures 1-3)

Type: Adult male, skin and skull, No. 3935, Mus. Calif. Acad. Sci., prepared by Virgil W. Owen from an example brought aboard ship by a member of the party, June 12, 1921, from Santa Catalina Island (25° 43' 50" N. Lat.), 17 miles N.E. of Punta San Marcial, Lower California.

General characters: Most nearly related to *Peromyscus californicus*, and of similar size, but external measurements exceeded by large examples of *californicus*.

Comparisons: Color of specimen (in worn pelage) decidedly paler than in average *californicus*, and largely pale



Skull of type of *Peromyscus slevini*. Fig. 1, dorsal aspect; fig. 2, ventral aspect; fig. 3, right mandible. All natural size.

cinnamon, darker dorsally through the admixture of fine, almost black hairs: below white, with less and much lighter touch of pale cinnamon in pectoral region; feet creamy white: fore legs very pale cinnamon; tail more sharply bicolor, with ventral side nearly white and dorsal side distinctly darker than any portion of dorsum; pelage shorter and ears smaller.

Skull similar in general to that of *californicus*, but narrower and differing in detail; interparietal much less extended laterally and its anterior margin forming an angle medianly somewhat greater than a right angle, giving to the anterior half of the interparietal a decidedly rhomboidal appearance, this margin in *californicus* being either straight across the skull about at right angles to the longitudinal axis or slightly curved; nasals reaching posteriorly well beyond posterior ends

of premaxillæ, instead of the ascending branches of the premaxillæ reaching or passing beyond posterior ends of nasals; zygomata slightly heavier; dentition similar to that of *californicus*, but the maxillary and mandibular toothrows somewhat longer, and the cusplet in the posterior reentrant angle of the second upper molar larger than usually found in the occasional skulls of *californicus* exhibiting this feature; incisive foramina longer in proportion to size of skull; mandible much deeper and heavier than in *californicus* skulls of equal condylo-basilar length, and, in fact, heavier than in any of the large series of *californicus* in the collection of the California Academy of Sciences.

In comparison with *Peromyscus californicus insignis*, the race of southern California, *slevini* appearing to represent a larger form with a larger skull and relatively heavier rostrum, differing in other particulars as from *californicus*.

Measurements: Skin: total length, 225 mm.; tail vertebræ, 120; hind foot, 27; ear from crown, 15; ear from notch, dry, 16.5. Skull: greatest length, 31; basilar length, 23; zygomatic width, 15.6; interorbital constriction, 4.6; interparietal, 9.2x3.7; nasals, 11.5; shelf of bony palate, 4.8; palatine slits, 7; diastema, 8.2; post-palatal length, 10.2; maxillary tooth-row, 4.9.

PROCEEDINGS
OF THE
CALIFORNIA ACADEMY OF SCIENCES
FOURTH SERIES

VOL. XII, Nos. 32 and 33, pp. 1223-1285, plates 89-92 OCTOBER 10, 1924

XXXII

**REPORT OF THE PRESIDENT OF THE ACADEMY
FOR THE YEAR 1923**

By C. E. GRUNSKY
President of the Academy

Complying with the requirements of the constitution of the California Academy of Sciences, the following report on the activities of the Academy during the year 1923 is submitted by your President.

Our membership has been slightly increased during the year 1923.

On January First, 1923, we had:—	
Members.....	1030
New Members added during the year were.....	91
Total.....	1121
We lost:—	
By death.....	23
By resignation.....	31
And dropped for delinquency in the payment of dues.....	13
Total.....	67
Membership on January First, 1924, was.....	1054

The membership is classified as follows:

Patrons.....	13
Honorary members.....	24
Life members.....	84
Fellows.....	23
Members.....	910
	<hr/>
	1054

The Academy carries on its list of patrons the following names:

Living

George C. Beckley	A. Kingsley Macomber
William B. Bourn	John W. Mailliard
William H. Crocker	Joseph Mailliard
Peter F. Dunne	M. Hall McAllister
Barton Warren Evermann	Ogden Mills
Herbert Fleishhacker	William C. Van Antwerp
Joseph D. Grant	

Deceased

William Alvord	James Lick
Charles Crocker	Alexander F. Morrison
John W. Hendrie	Amariah Pierce
Mrs. Charlotte Hosmer	Ignatz Steinhart

Those who were called by death during 1923 are as follows:

Boardman, Samuel H.	Member	July 14, 1923
Bothin, Henry E.	Member	October 14, 1923
Britton, John A.	Member	June 29, 1923
Carolan, Francis	Member	November 11, 1923
Drum, Frank G.	Member	August 28, 1923
Goodale, Prof. George L.	Honorary	April 11, 1923
Gregg, Wellington	Member	January 7, 1923
Halpin, George H.	Member	April 1, 1923
Hawxhurst, Robert	Life	January 9, 1923
Hirsch, Alphonse	Member	September 6, 1923
Hueter, E. L.	Member	November 10, 1923
Hughes, Hugh	Member	January 10, 1923
Jennings, Thomas	Member	March 30, 1923
Letts, Arthur	Member	May 18, 1923
Moore, George A.	Member	August 26, 1923
McCormick, E. O.	Member	November 1, 1923
Page, Arthur	Member	August 18, 1923
Perkins, George C.	Life	February 26, 1923
Rosenberg, Adolph	Member	March 26, 1923
Stoll, Dr. Otto	Honorary	
Thornton, A. W.	Member	March 16, 1923
Vogdes, General A. W.	Life	February 9, 1923
Wheeler, Charles Stetson	Member	April 27, 1923

The Academy has published during 1923 the following papers:

FOURTH SERIES OF THE PROCEEDINGS

- Vol. XI, No. 22, pp. 655-662—REPORT OF THE PRESIDENT OF THE ACADEMY FOR THE YEAR 1922, by C. E. Grunsky.
- Vol XI, No. 23, pp. 663-700—REPORT OF THE DIRECTOR OF THE MUSEUM FOR THE YEAR 1922, by Barton Warren Evermann.
- Vol XII, No. 1, pp. 1-26—FIELD WORK AMONG THE BIRDS AND MAMMALS OF THE NORTHERN COAST OF CALIFORNIA IN 1921, by Joseph Mailliard.
- Vol XII, No. 2, pp. 27-29—NEW SPECIES OF HYNOBIUS FROM JAPAN, by E. R. Dunn.

- Vol. XII, No. 3, pp. 31-41—UPPER MIOCENE LACUSTRINE MOLLUSKS FROM SONOMA COUNTY, CALIFORNIA, by G. Dallas Hanna.
- Vol. XII, No. 4, pp. 43-50—NOTES ON SOME LAND SNAILS OF THE SIERRA NEVADA MOUNTAINS, WITH DESCRIPTION OF A NEW SPECIES, by G. Dallas Hanna and Emmet Rixford.
- Vol. XII, No. 5, pp. 51-53—A NEW SPECIES OF CARYCHIUM FROM VANCOUVER ISLAND, BRITISH COLUMBIA, by G. Dallas Hanna.

Expedition of the California Academy of Sciences to the Gulf of California in 1921:

- Vol. XII, No. 6, pp. 55-72—GENERAL ACCOUNT, by Joseph R. Slevin.
- Vol. XII, No. 7, pp. 73-103—THE BEES (I), by T. D. A. Cockerell.
- Vol. XII, No. 8, pp. 105-112—NEW DOLICHOPODIDÆ (Long-legged Flies) by M. C. Van Duzee.
- Vol. XII, No. 9, pp. 113-115—THE GEOMETRID MOTHS, by W. S. Wright.
- Vol. XII, No. 10, pp. 117-122—THE TINEID MOTHS, by Annette F. Braun.
- Vol. XII, No. 11, pp. 123-200—THE HEMIPTERA (True Bugs, etc.), by Edward P. Van Duzee.
- Vol. XII, No. 12, pp. 201-288—THE TENEBRIONIDÆ, by Frank Ellsworth Blaisdell, Sr.
- Vol. XII, No. 13, pp. 289-314—THE BOMBYLIDÆ (Bee Flies), by Frank R. Cole.
- Vol. XII, No. 14, pp. 315-318—SOME COCCIDÆ FROM ABOUT THE GULF OF CALIFORNIA, by G. F. Ferris and J. B. Kelly.
- Vol. XII, No. 15, pp. 319-340—THE DERMAPTERA AND ORTHOPTERA, by Morgan Hebard.
- Vol. XII, No. 16, pp. 341-351—A REVISION OF THE GENUS ANISEMBIA, WITH DESCRIPTION OF A NEW SPECIES FROM THE GULF OF CALIFORNIA, by Joseph C. Chamberlin.
- Vol. XII, No. 17, pp. 353-387—NEW AND LITTLE KNOWN PSEUDOSCORPIONS, PRINCIPALLY FROM THE ISLAND AND ADJACENT SHORES OF THE GULF OF CALIFORNIA, by Joseph C. Chamberlin.
- Vol. XII, No. 18, pp. 389-407—ON CHILOPODS AND DIPLODODS FROM ISLANDS IN THE GULF OF CALIFORNIA, by Ralph V. Chamberlin.
- Vol. XII, No. 19, pp. 409-421—THE MELYRIDÆ (Lesser Flower Beetles), by Frank E. Blaisdell, Sr.
- Vol. XII, No. 20, pp. 423-424—NOCTUIDÆ (Moths). A NEW SUBSPECIES OF *Escaria clauda* Grote by Wm. Barnes and F. H. Benjamin.
- Vol. XII, No. 21, pp. 425-428—ANYTHOMYIDÆ AND LONCHÆIDÆ (Kelp Flies and their Allies), by J. R. Malloch.
- Vol. XII, No. 22, pp. 429-436—THE BEMBICINI (Digger Wasps), by Charles L. Fox.
- Vol. XII, No. 23, pp. 437-442—OBSERVATIONS ON SURFACE DISTRIBUTION OF MARINE DIATOMS OF LOWER CALIFORNIA IN 1921, by W. E. Allen.
- Vol. XII, No. 24, pp. 443-456—THE BIRDS, by Joseph Mailliard.
- Vol. XII, No. 25, pp. 457-481—DIPTERA FROM THE ISLANDS AND ADJACENT SHORES OF THE GULF OF CALIFORNIA, by Frank R. Cole.
- Vol. XII, No. 26, pp. 483-527—LAND AND FRESHWATER MOLLUSKS, by G. Dallas Hanna.
- Vol. XIII, No. 1, pp. 1-2—PRELIMINARY DIAGNOSES OF FOUR NEW SNAKES FROM LOWER CALIFORNIA, MEXICO, by John Van Denburgh and Joseph R. Slevin.

- Vol. XIII, No. 2, pp. 3-4—A NEW SUBSPECIES OF WATERSNAKE (*Natrix vibakeri ruthveni*), FROM EASTERN ASIA, by John Van Denburgh.
- Vol. XIII, No. 3, pp. 7-28—FURTHER NOTES ON THE BIRDS AND MAMMALS OF SISKIYOU COUNTY, CALIFORNIA, by Joseph Mailliard.
- Vol. XIII, No. 4, pp. 29-41—FALL FIELD WORK IN PLUMAS AND YUBA COUNTIES, CALIFORNIA IN 1922, by Joseph Mailliard.
- Vol. XIII, No. 5, pp. 43-109—OBSERVATIONS UPON THE BIRD LIFE OF DEATH VALLEY, by Joseph Grinnell.
- Vol. XIII, No. 6, pp. 111-130—NOTES ON THE HEPATICÆ OF CALIFORNIA, by Alexander W. Evans.

During the year 1923 11 free lectures were delivered at the stated meetings of the Academy, as follows:

- JANUARY 3. The Public Shooting Ground—Game Refuge Bill; and An International Treaty for the Conservation of the Fisheries of the Pacific; by Dr. Barton Warren Evermann, Director, California Academy of Sciences; Dr. Joseph Grinnell, Director Museum of Vertebrate Zoology; Mr. M. Hall McAllister, Treasurer, California Academy of Sciences; Dr. H. C. Bryant, in charge, Education, Publicity, and Research, California Fish and Game Commission; Mr. C. B. Lastreto, San Francisco, California; Mr. Joseph Mailliard, Curator of the Department of Ornithology and Mammalogy, and others.
- MARCH 7. The Habits and Characteristics of the California Mountain Lion and Methods of Hunting It. Illustrated, by Mr. Jay C. Bruce, Official Mountain Lion Hunter, California Fish and Game Commission.
- APRIL 4. Life and Habits of the Golden Eagle in California, by Mr. W. P. Steinbeck, Stockton, California.
- MAY 2. Hawaiian Trails and Mountains. Illustrated, by Dr. Vaughan MacCaughey, Superintendent of Public Instruction, Territory of Hawaii.
- JUNE 6. Hunting in Africa with Camera and Gun. Illustrated, by Mr. R. C. Baird, the Bank of California, San Francisco.
- JULY 5. A Naturalist's Visit to San Francisco Mountain, Arizona, by Mr. Harry S. Swarth, Curator of Birds, Museum of Vertebrate Zoology, University of California.
- AUGUST 1. The Procession of Flowers on Mount Tamalpais, by Miss Alice Eastwood, Curator, Department of Botany, California Academy of Sciences, San Francisco.
- SEPTEMBER 5. Guadalupe Island Elephant Seals. Illustrated, by Dr. G. Dallas Hanna, Curator, Department of Invertebrate Paleontology, California Academy of Sciences, San Francisco.
- OCTOBER 3. Trails and Camps in Lower California. Illustrated, by Dr. John Van Denburgh, San Francisco.
- NOVEMBER 7. Geography and the Making of Species, by Dr. Joseph Grinnell, Director, Museum of Vertebrate Zoology, Berkeley, California.
- DECEMBER 5. The Shore Birds of the San Francisco Bay Region. Illustrated, by Mrs. G. Earle Kelly, Alameda, California.

The Sunday afternoon lectures delivered in the Museum building during 1923 included the following:

- JANUARY 7. How Animals Eat; A Chalk Talk for the Children. Illustrated, by Dr. J. S. Kingsley, Berkeley, California.
- JANUARY 14. China Old and New. Illustrated with stereopticon slides and moving pictures, by Dr. C. K. Edmunds, President, Canton Christian College, Canton, China.
- JANUARY 21. Palestine: Its Geology and Geography. Illustrated, by Prof. Earle G. Linsley, Professor of Geography and Geology, Mills College.
- JANUARY 28. Changing Changeless Palestine:—Economic and Political Conditions. Illustrated, by Prof. Earle G. Linsley, Professor of Geography and Geology, Mills College.
- FEBRUARY 4. A Naturalist's Rambles in Southwestern Deserts. Illustrated, by Dr. F. B. Sumner, Associate Professor of Biology, Scripps Institution for Biological Research, La Jolla, California.
- FEBRUARY 11. Giant Forest and the High Sierras. Illustrated, by Mr. Guy Hopping, Chief Ranger, Sequoia and General Grant National Parks.
- FEBRUARY 18. Some Facts about the Mountain Lion and the Coyote. Illustrated, by Mr. Joseph Dixon, Economic Mammalogist, Museum of Vertebrate Zoology, Berkeley.
- FEBRUARY 25. San Francisco, a World City. Illustrated with motion pictures, by Mr. Robert Newton Lynch, Vice-President and General Manager, San Francisco Chamber of Commerce.
- MARCH 4. The Monroe Doctrine: What it is not, and What it is, by Mr. Edward Berwick, Publicist, Pacific Grove, California.
- MARCH 11. America as seen by the first Japanese Embassy, by Mr. T. Komatsu, Manager, Toyo Kisen Kaisha for America.
- MARCH 18. History and Political Life of Chile. Illustrated, by Hon. Marcos G. Huidobro, Consul for Chile.
- MARCH 25. Art, Literature, and Intellectual Development in Chile. Illustrated, by Hon. Marcos G. Huidobro, Consul for Chile.
- APRIL 1. Weather Forecasting for the Pacific States. Illustrated, by Mr. E. A. Beals, Meteorologist, United States Weather Bureau, San Francisco.
- APRIL 8. Our Solar System and What we Know of Its Origin. Illustrated, by Dr. Robert G. Aitken, Astronomer, Lick Observatory.
- APRIL 15. California's Mountain Play Grounds. Illustrated, by Mr. Paul G. Redington, District Forester, United States Forest Service, San Francisco.
- APRIL 22. Experiments with Species Hybrids and Their Bearing on Evolution. Illustrated, by Prof. E. B. Babcock, Professor of Genetics, University of California.
- APRIL 29. California's Wild Life in Motion Pictures. Illustrated, by Dr. H. C. Bryant, in charge, Education, Publicity and Research, California Fish and Game Commission.

- MAY 6. Algeria. Illustrated, by Mr. I. H. Morse, San Francisco.
- MAY 13. Hay Fever and Asthma in Relation to Plant Pollen. Illustrated, by Dr. Harvey M. Hall, Carnegie Institution of Washington.
- MAY 20. Malaria and the Mosquito. Illustrated with moving pictures, by Prof. W. B. Herms, Professor of Parasitology, University of California.
- MAY 27. Monkeys and Men. Illustrated, by Dr. James G. Needham, Professor of Entomology and Limnology, Cornell University.
- NOVEMBER 4. The Manchurian Plague Epidemic of 1921. Illustrated, by Dr. Ivan C. Hall, Associate Professor of Bacteriology, University of California.
- NOVEMBER 11. The Introduction of Foreign Birds and Mammals into the United States, by Dr. Joseph Grinnell, Director, Museum of Vertebrate Zoology.
- NOVEMBER 18. The Bacillus of Long Life, a Discussion of the Sour Milk Therapy. Illustrated, by Dr. Ivan C. Hall, Associate Professor of Bacteriology, University of California.
- NOVEMBER 25. Bird-life as a Community Asset, by Dr. Joseph Grinnell, Director, Museum of Vertebrate Zoology.
- DECEMBER 2. Missionary Work in New Guinea. Illustrated, by Rev. Charles W. Abel, Director of the New Guinea Evangelization Society.
- DECEMBER 9. Saving the Redwoods,—a Priceless Heritage. Illustrated, by Hon. Joseph D. Grant, Vice-President, Save the Redwoods League.
- DECEMBER 16. The Shore Birds of the San Francisco Bay Region. Illustrated, by Mrs. G. Earle Kelly, Alameda, California.
- DECEMBER 23. The Trees and Shrubs of Marin County, by Miss Alice Eastwood, Curator of Botany, California Academy of Sciences, San Francisco.

An analysis of the Treasurer's records will show that, apart from the operation of the Aquarium, the Academy has expended during the year on the operation and maintenance of its museum and the activities of its curators and their assistants the sum of \$53,882.67. The mortgage debt of the Academy has been reduced during the year by another \$10,000. It is now \$260,000. Interest on this mortgage was paid to the amount of \$15,730.52.

The John W. Hendrie Endowment of \$10,000 invested in 60 shares of the Mercantile Trust Company has yielded an income of \$900 during the calendar year 1923. This will be expended as hitherto in the publication of scientific papers.

The operation and maintenance of the aquarium was estimated to require \$40,260 for the fiscal year 1923-24. The

expenditures to February first of this year, since July first, indicate that this estimate was substantially correct.

A detailed statement of the Ignatz Steinhart Trust to December 31, 1923, accompanies the Treasurer's Report.

It is notable that the bequest of \$250,000 from the Ignatz Steinhart Trust was increased by interest on temporary investments nearly 20 per cent, providing a total of \$304,757.46 for the erection and equipment of the Steinhart Aquarium. Of this amount \$22,332.26 remains unexpended, and will be utilized as exigencies demand in perfecting the equipment.

On July 1, 1923, building operations on the Steinhart Aquarium were practically completed and operation by the Academy with funds provided by the City and County of San Francisco commenced at that time. On September 29, 1923, the Aquarium was formally dedicated and opened to the public with appropriate ceremonies. From the date of the opening to the end of the year 548,137 people have visited the Aquarium, a record probably not exceeded, if equalled, by any similar institution in the world.

A wonderful display of aquatic life is here presented which wins enthusiastic appreciation from all visitors. It will prove of incalculable benefit to the City of San Francisco and stands as a monument to the public spirit of Ignatz Steinhart.

Taylor Collection of Reptiles and Amphibians

The acquisition of this valuable collection of reptiles and amphibians from the Philippine Islands was completed during the past year. It was made possible by the following donations:

William H. Crocker.....	\$4,500.00
Herbert Fleishhacker.....	500.00

The problem of supplying glass containers for this collection was generously met by donations from the following members of the Academy:

William F. Herrin.....	\$100.00
C. O. G. Miller.....	100.00
Selah Chamberlain.....	100.00
Louis F. Monteagle.....	50.00
George Uhl.....	20.00
	<hr/>
	\$370.00

Cross Sections of Sequoias

Through the generosity of Trustee Joseph D. Grant, who defrayed the entire cost of transportation and installation, one cross section each of the *Sequoia gigantea* and *Sequoia sempervirens* were presented to the Museum. These are appropriately installed in a manner to display the annual ring-growth with chronological data exhibiting contemporary events during the life of the trees. The age of one is 1710 years.

A Natural History of the Ducks

The Academy now possesses a copy of the valuable monograph on the "Natural History of the Ducks of the World," by Dr. John C. Phillips, thanks to the generosity of Dr. Emmet Rixford, Dr. Arthur H. Taylor, Mr. H. B. Blatchley, Mr. José Costa, Mr. Thomas Palache, and Mr. J. B. McCauley, who contributed \$200 for its purchase. This work is in four volumes, two of which have been received. A limited edition, profusely illustrated, is being issued to subscribers only.

Mary E. Hart Bequest

On February 2, 1923, a bequest of \$100 was received from the Mary E. Hart Estate in lieu of certain collections of Indian baskets mentioned in her will but which could not be located.

The Academy is sincerely appreciative of such donations and contributions which make possible the extension of its activities. In this connection it should be noted that the Academy is assisting in the matter of the preservation of wild life. It is acting as the agent for the disbursement of certain funds entrusted to it for this purpose.

Details of the work done during the year will appear from the reports of the Director of the Museum and the curators of the Academy's various departments. The work in all of these has been advanced with commendable energy.

That the Academy's work is appreciated and recognized in wide circles will appear from the following comment by

Dr. Charles D. Walcott, Secretary of the Smithsonian Institution. He says under date of December 22, 1923, with special reference to the expedition which the Academy sent to the Gulf of California in 1921, "I wish to congratulate all concerned on the fine research work that the Academy is doing, and upon the manner in which the results of the various scientific activities are being published. I also wish to congratulate you on the progress of the Aquarium, and the public spirit shown by the people of California in sustaining the work of the Academy."

XXXIII

REPORT OF THE DIRECTOR OF THE MUSEUM
FOR THE YEAR 1923

By BARTON WARREN EVERMANN
Director of the Museum

The annual report of the Director for the year 1922 was presented to the Academy at the annual meeting, February 21, 1923. During the past year the activities of the Museum have continued in a satisfactory way and very considerable additions and improvements have been made; these will be fully presented in their respective appropriate places.

PERSONNEL

The personnel of the Museum has undergone only slight change in the year, the employes of the Academy at this date being as follows: Dr. Barton Warren Evermann, Director and Executive Curator of the Museum, Editor of the Academy publications, and Director of the Steinhart Aquarium; W. W. Sargeant, Secretary to the Board of Trustees; Miss Susie M. Peers, Secretary to the Director; Joseph W. Hobson, Recording Secretary; Miss Alice Eastwood, Curator, and Mrs. Kate E. Phelps, assistant, Department of Botany; Edward P. Van Duzee, Curator, Dr. F. R. Cole, Curator in Dipterology, and J. O. Martin, assistant, Department of Entomology; Dr. John Van Denburgh, Curator, and Joseph R. Slevin, assistant curator, Department of Herpetology; Dr. G. Dallas Hanna, Curator, Dr. Roy E. Dickerson and F. M. Anderson, honorary curators, Merle Israelsky, assistant curator, and William Barbat, temporary assistant, Department of Invertebrate Paleontology; Joseph Mailliard, Curator, and Miss Mary E. McLellan, assistant curator, Department of Ornithology and Mammalogy; Dr. Walter K. Fisher, Curator, Department of Invertebrate Zoology; Frank Tose, Chief taxidermist, Chandler Smith, Russell Hendricks, Douglas Kelly and Cecil Tose, student assistants, Department of Taxidermy; Edward P. Van Duzee, assistant librarian, Mrs. Helen Van Duzee, library assistant, and Dean Burk, temporary library assistant; Wm. C.

Lewis, janitor; George W. Edwards, assistant janitor; Frank W. Yale, assistant janitor; Raymond L. Smith, doorkeeper and general assistant; J. H. Kavanaugh, day watch; Archie McCarte, night watch; Mrs. Johanna E. Wilkens, janitress.

ACCESSIONS TO THE MUSEUM AND LIBRARY

As in the past, the accessions to the museum and the library have been many and valuable. A few of the more notable are mentioned in the President's report and a detailed list will be found in the appendix to this report (pp. 1269-1278).

CO-OPERATION WITH PUBLIC AND PRIVATE SCHOOLS

Co-operation with the schools in their educational work has been more close and effective than in any previous year. Appreciation of the educational value of visits to the Museum for the purpose of studying the habitat groups and other collections seems to be growing among the teachers and school officials and schools are visiting the Museum in increasing numbers. Within the year our taxidermists have completed eleven portable habitat groups designed as loan exhibits for use in the public schools. The groups are as follows: Western Meadow Lark, Western Robin, California Woodpecker, San Francisco Towhee, Barn Owl, Least Sandpiper, Killdeer, Western Savannah Sparrow, California Ground Squirrel, Redwood Weasel, Sierra Chickaree, Sierra Golden-mantled Ground Squirrel and Spiny Pocket Mouse. These are now being circulated in the Berkeley and San Francisco public schools, under the immediate supervision of Mrs. Anna V. Dorris, Director of Visual Instruction in the Berkeley Public Schools.

Other exhibits of this character will be prepared as time and materials permit. It is to be regretted that we have not two or three expert preparators who can devote all their time to the preparation of exhibits suitable for loan to the schools.

The Director and various members of the staff have been called upon to lecture before various schools, clubs and elsewhere in the interest of public education. The requests that come to the Director for lectures have been more numerous than he could accept.

The number of teachers and students who come to the Museum to examine and study specimens in our research collections is increasing and the number of pupils that come as *schools with their teachers* to study the habitat groups and other exhibits is also increasing, the numbers for the year 1923 being as follows:

<i>Schools of San Francisco:</i>	
Number of classes.....	185
Number of teachers.....	167
Number of pupils.....	5225
<i>Schools Outside of San Francisco:</i>	
Number of classes.....	52
Number of teachers.....	51
Number of pupils.....	1095
<i>Grand Totals:</i>	
Total number of classes.....	237
Total number of teachers.....	218
Total number of pupils.....	6320

VISITORS TO THE MUSEUM

The Museum has been open to the public every day in the year. The popularity of the Museum seems unabated. The recognition of the educational value of the exhibits seems more pronounced than ever before. The total number of visitors during the past year was 498,775. The number by months and years since the opening, September 22, 1916, is shown in the following table:

Month—	1916	1917	1918	1919	1920	1921	1922	1923
January.....	23170	25260	17241	27013	25755	19038	15270	
February.....	22058	23698	17586	23450	25679	18534	20529	
March.....	31606	26810	27397	25419	28279	27922	26341	
April.....	32175	23274	25994	32208	24939	36057	21911	
May.....	26154	26391	28369	37107	25517	27237	37597	
June.....	32123	29843	32248	36207	29406	27131	39511	
July.....	37193	31420	48028	52492	43186	36263	64530	
August.....	24619	31137	43730	53470	39422	34787	50849	
September.....	16448	27866	29847	34007	42013	31458	28408	69870
October.....	36933	20629	14743	30463	33500	24861	19459	66894
November.....	27718	21810	8531	25246	19347	18593	19080	48766
December.....	15002	21693	19588	21188	21340	15062	13339	36707
Total.....	96101	321096	290542	351497	403566	332157	307255	498775

DEPARTMENT ACTIVITIES

The same spirit of enthusiasm, industry, loyalty, and hearty cooperation which has always characterized the members of

the staff continues undiminished. It is this splendid characteristic that has enabled the Museum to accomplish so much with its limited resources, and I wish to take this opportunity to express my appreciation.

The activities of the various departments will be set forth fully in the reports of the respective curators; only brief mention of some of them need be made here.

Miss Eastwood, curator of botany, spent a few days in early September in northern Lower California, where she obtained a considerable collection of herbarium specimens. Brief trips made by the curator to various California localities resulted in small but valuable collections.

Mr. Van Duzee, curator of entomology, made short collecting trips to the Potholes and Yuma, to the San Bernardino Mountains, to San Diego County and the northern portion of Lower California, and the vicinity of Mt. Diablo and Pittsburg.

Dr. Van Denburgh and Mr. Slevin of the department of herpetology, as guests of the Mexican Government, made an extended collecting trip into the San Pedro Martir Mountains, in northern Lower California, where they obtained many valuable specimens. They also spent some time collecting in San Diego, Imperial, Orange, Riverside and Los Angeles counties, in southern California, and on Todos Santos Islands, Lower California.

The growth of the Library has been slower than it should have been. Larger appropriations are required for the purchase of books that are seriously needed in the work of the various departments and for binding books and pamphlets that should be bound in order to prevent injury.

Mr. Mailliard of the departments of mammalogy and ornithology, assisted by Mr. Frank Tose, chief taxidermist, spent one week in April at the Potholes, where good collections of birds and the smaller mammals, including material for several habitat groups, were obtained. In April to June field work was carried on by Mr. Mailliard in Shasta, Lassen, and Modoc counties, followed by work in Butte and Lassen counties and in Marin County.

Dr. Hanna, curator of invertebrate paleontology, made several short trips to various parts of the State which resulted in the addition of valuable collections to that department.

MEETING OF THE PACIFIC DIVISION OF THE AMERICAN
ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
AND ITS AFFILIATED SOCIETIES

The 1923 meeting was held at Los Angeles September 17-20, in the buildings of the University of Southern California, in conjunction with the Summer Session of the American Association for the Advancement of Science. The meeting proved to be one of the most successful and interesting the Division has ever had. The meetings of the various affiliated societies were of unusual interest, particularly those of the Astronomical Society of the Pacific, due in large part to the large number of astronomers who had come to southern California on account of the eclipse of September 10.

The Academy was well represented in the attendance and on the various programs. Professor E. P. Lewis delivered the Presidential address on the evening of September 17, his subject being "The Contributions of Astronomy to Civilization." Vice-President C. E. Grunsky presided at most of the general sessions. Among the members of the Academy who were in attendance and many of whom were on the program were the following: Clinton G. Abbott, Le Roy Abrams, Robert G. Aitken, W. E. Allen, F. M. Anderson, Alfred W. Anthony, Ralph Arnold, Edward A. Beals, A. J. Basinger, S. Stillman Berry, Charles Lewis Camp, Douglas H. Campbell, Bruce L. Clark, F. C. Clark, John N. Cobb, Frank R. Cole, Alfred Cookman, John Adams Comstock, Donald R. Dickey, E. T. Dumble, W. F. Durand, Alice Eastwood, E. O. Essig, Barton Warren Evermann, Joseph Grinnell, C. E. Grunsky, G. Dallas Hanna, W. B. Hermis, A. Brasier Howell, Merle C. Israelsky, Edmund C. Jaeger, David Starr Jordan, J. S. Kingsley, C. B. Lastreto, Eugene Law, A. O. Leuschner, E. P. Lewis, Chas. B. Lipman, D. T. MacDougal, E. G. Martin, Isabel McCracken, George F. McEwen, John C. Merriam, Elmer G. Osterhoudt, G. P. Rixford, Mrs. Dorothea K. Roberts, W. W. Sargeant, N. B. Scofield, Alvin Seale, Chester Stock, C. S. Stoltenberg, James Rollin Slonaker, F. B. Sumner, Walter Penn Taylor, Will F. Thompson, Sidney Dean Townley, Edward P. Van Duzee, A. G. Vestal, Alfred O. Woodford, and W. S. Wright.

USE OF THE ACADEMY'S LIBRARY AND COLLECTIONS
BY INVESTIGATORS AND STUDENTS

During the year the number of investigators, students and teachers who have made use of the library, study collections and laboratories was larger than ever before.

From time to time young men interested in natural history have expressed the wish that the Academy might offer instruction in methods of collecting and in taxidermy. In order to meet this demand our chief taxidermist arranged to receive as student assistants members of the Academy or members of their families who desire instruction along those lines. Among those who have availed themselves of this opportunity to learn the principles and methods of natural history collecting and taxidermy are the following: C. P. Russell, Chandler Smith, Russell Hendricks, Douglas Kelly, and Cecil Tose.

The Boy Scouts, under Scout Master Harold E. Hansen, continue to hold their regular weekly meetings in the Academy's Auditorium.

PUBLICATIONS BY THE MUSEUM STAFF

The curators and others connected with the Museum staff have been active in contributing to the literature of their respective subjects. The list of their contributions for 1923 is as follows:

Evermann, Barton Warren

1. Conservation of the Marine Life of the Pacific. <Mid-Pacific Magazine, Vol. XXV, No. 4, pp. 303-328, April, 1923.
2. The Steinhart Aquarium. <The Oakland Tribune, April, 1923.
3. Red Snappers and That Sort of Thing. <Outdoor Life, Vol. LI, No. 5, pp. 333-336, May, 1923.
4. The Pelicans of Pyramid Lake. <Overland Monthly, Vol. LXXXI, No. 1, pp. 16-18 and 45, May, 1923.
5. The Conservation of the Marine Life of the Pacific. <Scientific Monthly, Vol. XVI, No. 5, pp. 521-538, May, 1923.
6. The Fishery Resources of the Pacific. <The Catalina Islander, Vol. X, No. 16, pp. 1-2, May 2, 1923; continued in Vol. X, No. 17, May 9, pp. 1-2 and 10; No. 18, May 16, pp. 1-2; No. 19, May 23, pp. 2, 4, 5, 8.
7. The Marine Life of the Pacific. <Trans. Commonwealth Club of California, Vol. XVIII, No. 3, pp. 105-119, May, 1923.
8. Notes on Fishes from Apia, Samoa. <Copeia, No. 119, pp. 70-71, June 16, 1923 (with Alvin Seale).

9. Notes on Fishes from Guadalcanar, Solomon Islands. <Copeia, No. 120, pp. 77-78, July 20, 1923 (with Alvin Seale).
10. The Seals and Otters of the Pacific. <Fur Trade Review, August, 1923, pp. 94-100.
11. Report of the Director of the Museum for the year 1922. <Proc. Calif. Acad. of Sci., 4th Ser., Vol. XI, No. 23, pp. 663-700, August 22, 1923.
12. The Steinhart Aquarium and its Hawaiian Fishes. <Aloha, Vol. 4, No. 7, pp. 3-5, September, 1923.
13. The Pacific Fisheries as Contributors to the Wealth of the Nation. <San Francisco Business, Vol. 7, No. 11, pp. 8-9, September 14, 1923.
14. Dr. Richard Gause Boone. <The Sierra Educational News, Vol. XIX, No. 8, pp. 469-470, October, 1923.
15. The Steinhart Aquarium. <California Fish and Game, Vol. 9, No. 3, pp. 106-108, July, 1923.
16. The Steinhart Aquarium opened at San Francisco. <California Fish and Game, Vol. X, No. 44, pp. 1-2, November 14, 1923.

Slevin, Joseph R.

1. Expedition of the California Academy of Sciences to the Gulf of California in 1921. General Account. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XII, No. 6, pp. 55-72, map, June 2, 1923.

Van Denburgh, John

1. A New Subspecies of Watersnake (*Natrix vibakari ruhveni*) from Eastern Asia. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XIII, No. 2, pp. 3-4, July 26, 1923.

Van Denburgh, John, and Slevin, Joseph R.

1. Preliminary Diagnoses of four New Snakes from Lower California, Mexico. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XIII, No. 1, pp. 1-2, July 25, 1923.

Mailliard, Joseph

1. Field Work Among the Birds and Mammals of the Northwest Coast of California in 1921. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XII, No. 1, pp. 1-26, January 2, 1923.
2. The Tree Swallow Added to the Pribilof List. <Condor, Vol. XXV, No. 1, p. 31, January 17, 1923.
3. Census of Birds' Nests in the Music Concourse, Golden Gate Park, San Francisco, Calif. <Gull, Vol. 5, No. 3, pp. 2-3, March, 1923.
4. An Explanation of a Seeming Discrepancy. <Condor, Vol. XXV, No. 3, p. 108, May 19, 1923.
5. How is This for Conservation of Wild Life? <Condor, Vol. XXV, No. 4, pp. 125-126, July 28, 1923.
6. Early Nesting of Nuttall Sparrow in Golden Gate Park. <Condor, Vol. XXV, No. 4, p. 133, July 28, 1923.
7. Expedition of the California Academy of Sciences to the Gulf of California in 1921. The Birds. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XII, No. 24, pp. 443-456, August 21, 1923.

8. Report of the Department of Exhibits, California Academy of Sciences, for 1922. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XI, Nos. 22-23, pp. 678-679, August 22, 1923 (in Report of Director for 1922).
9. Report of the Department of Mammalogy, California Academy of Sciences, for 1922. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XI, No. 23, pp. 682-683, August 22, 1923 (in Report of Director for 1922).
10. Report of the Department of Ornithology, California Academy of Sciences, for 1922. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XI, No. 23, pp. 683-684, August 22, 1923 (in Report of Director for 1922).
11. Further Notes on the Birds and Mammals of Siskiyou County, California. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XIII, No. 3, pp. 7-28, September 13, 1923.
12. Fall Field Work in Plumas and Yuba Counties, California, in 1922. <Proc. Calif. Acad. Sci., 4th Ser., Vol. XIII, No. 4, pp. 29-41, October 15, 1923.

Van Duzee, Edward P.

1. An Entomological Antique. <Science, New Series, Vol. LVII, p. 269, March 2, 1923.
2. Expedition of the California Academy of Sciences to the Gulf of California in 1921. The Hemiptera. <Proc. Calif. Acad. Sci., 4th Series, Vol. XII, No. 11, pp. 123-200, June 7, 1923.
3. Hemiptera or Sucking Insects of Connecticut. Family Fulgoridæ. <Conn. State Geol. and Nat. Hist. Surv., Bul. No. 34, pp. 24-55, July, 1923.
4. Notes on *Lygæus kalmii* Stål and Allies (Hemiptera). <Canadian Entomologist, Vol. LV, p. 214, September, 1923.
5. A New Subspecies of *Euryophthalmus cinctus* (Hemiptera). <Canadian Entomologist, Vol. LV, p. 270, November, 1923.
6. A Rearrangement of our North American Thyreocorinæ (Hemiptera). <Entomological News, Vol. XXXIV, pp. 302-305, December, 1923.

Hanna, G. Dallas

1. Notes on Some Land Snails of the Sierra Nevada Mountains with Description of a New Species. <By G. Dallas Hanna and Emmet Rixford. Proc. Calif. Acad. Sci., 4th Ser., Vol. 12, No. 4, pp. 43-50, pl. 4, Jan. 2, 1923.
2. Upper Miocene Lacustrine Mollusks from Sonoma County, California. <Proc. Calif. Acad. Sci., 4th Ser., Vol. 12, No. 3, pp. 31-41, pls. 1-3, Jan. 2, 1923.
3. A New Species of *Carychium* from Vancouver Island, British Columbia. <Proc. Calif. Acad. Sci., Vol. 12, No. 5, pp. 51-53, text fig. 1., Jan. 2, 1923.
4. What is the Future of the Fur Seal? <Fur Trade Review, January, 1923, pp. 357-358, 359. (Three photographs accompanying article were printed in same number but inadvertently placed under article by W. J. Brett.)
5. Random Notes on Alaska Snow Buntings. <Condor, Vol. 25, No. 2, pp. 60-65, 2 photographs, March-April, 1923.

6. (Review of Fauna from the Eocene of Washington, by Charles E. Weaver and Katherine Van Winkle Palmer. <Univ. Wash. Publ. Geol., Vol. 1, No. 3, June, 1922). >The Nautilus, Vol. 36, April, 1923, pp. 141, 142.
7. (Review of the Same Paper). <Journal of Geology, Vol. 31, No. 3, pp. 261-263, April-May, 1923.
8. (A Biological Survey of the Pribilof Islands, Alaska, by Edward A. Preble, W. L. McAtee and others. <North American Fauna No. 46, U. S. Dept. Agriculture, June 20, 1923, pp. 1-257, pls. 1-15). The publication is based largely on collections made by G. Dallas Hanna and contains seven of his photographs as well as large numbers of his field notes.
9. Annual Report of the Department of Invertebrate Paleontology for 1922. <Proc. Calif. Acad. Sci., Vol. 11, 4th Ser., pp. 680-683, August 22, 1923. Bibliography of G. D. H. on pp. 670-672.
10. (Map of the Gulf of California, Showing Route of California Academy of Sciences 1921 Expedition. Based upon Charts Nos. 620, 621, 1006, U. S. Hydrographic Office). <In Expedition of the California Academy of Sciences to the Gulf of California in 1921, General Account by Joseph R. Slevin. <Proc. Calif. Acad. Sci., 4th Ser., Vol. 12, No. 6, opp. p. 72, June 2, 1923.
11. Results of Preliminary Examination of seven samples of Sediments from near Lomitas (Los Angeles, County, California.) <Bull. Southern Calif. Acad. Sci., Vol. 22, pt. 2, p. 64, July, 1923.
12. A Cruise Among Desert Islands (with A. W. Anthony.) <National Geographic Magazine, Vol. 44, No. 1, pp. 71-99, 33 photographs, July, 1923. Syndicated article "Survival of the Unfit," by Henry Smith Williams, San Francisco Examiner, Oct. 22, 1923, etc., based on this. Also an article and photographs in The Illustrated London News, September 27, 1923, was based on this account. Another Article entitled "A Brother of the Strange Beasts before Adam," based on this appeared in the Literary Digest, Vol. 79, No. 8, November 24, 1923, pp. 50-52, 3 photographs.
13. Note on *Lymnaea hemphilliana* (Baker). <Nautilus, Vol. 37, No. 1, p. 23, July, 1923.
14. Pleistocene Freshwater Mollusks from North Central Texas. <Nautilus, Vol. 37, No. 1, p. 25, July, 1923.
15. Some Eocene Foraminifera near Vacaville, California. <Univ. Calif. Publ. Geol., Vol. 14, No. 9, pp. 319-328, pls. 58-59, Oct. 31, 1923.
16. Rare Mammals of the Pribilof Islands, Alaska. <Journal of Mammalogy, Vol. 4, No. 4, pp. 209-215, pl. 23, Nov. 1923.
17. Results of California Academy of Sciences Expedition to the Gulf of California in 1921. Land and Freshwater Mollusca. <Proc. Calif. Acad. Sci., 4th Ser., Vol. 12, No. 26, pp. 483-527, pls. 7-11, Dec. 31, 1923.

Eastwood, Alice

1. The Winter Flowers on Mt. Tamalpais. <Out of Doors, January, 1923.

2. The Origin of Some Locality and Trail Names on Mt. Tamalpais. <Out of Doors, April, 1923.
3. The Fall Flora of Mt. Tamalpais. <Out of Doors, September, 1923.
4. Trees of Mt. Tamalpais. <Trails (the yearly bulletin of the California Alpine Club).
5. The Botany of that part of Menzies' Journal relating to California. <Calif. Historical Society, January, 1924.

NEEDS OF THE MUSEUM

The increase in the activities of the Academy and the growth in the work of the various departments in the past year have increased the needs of the Academy until they are now more numerous and greater than ever before. Every department is growing in its collections and material equipment. The floor space, never entirely adequate, in each department, is now more than exhausted. Many collections and specimens valuable for exhibition purposes and others that should always be readily accessible for research have to be stored and are difficult of access. In the department of botany it has been found necessary to place some 20 herbarium cases in the hall. The department of ornithology and mammalogy has found it necessary to store many valuable specimens in a number of places difficult to reach.

We have no space available for exhibits in the departments of entomology, herpetology, paleontology, invertebrate zoology, or botany.

It has long been the desire of Mr. Van Duzee to put on exhibition properly prepared specimens of many of the economically important insects such as the Anopheles and Stegomyia mosquitoes and other carriers of disease, the insects injurious to agricultural and horticultural crops, and those injurious to domestic animals. Such exhibits as he has in mind would be intensely interesting and of great educational value.

The department of paleontology is in a position to provide a number of exhibits that would prove very instructive particularly in economic geology, and the department of herpetology could readily provide a number of exhibits that would rival in scientific and popular interest any of the habitat groups we now have. The same may be said of the other departments, particularly that of botany. It would be a comparatively easy

matter to provide many botanical exhibits that would prove of unusual interest and value. The department of ornithology and mammalogy has no suitable place for displaying any of the species of birds or mammals of intermediate size, such as the larger hawks and owls, ravens, crows, waders, foxes, wolverine, marten, mink, and similar species. It has been the desire of the Director to have installed a comprehensive exhibit of the fur-bearing animals of California. This exhibit would include one or more mounted animals and at least two dressed skins (one prime and one unprime) of each species; also descriptive matter regarding the abundance, distribution, habits and commercial value of each species, and the laws for their protection or capture. If we had suitable space for the display of such animals there is little doubt but that the furriers of San Francisco and others would be glad to assist in making such an exhibit possible.

Another exhibit which the curator of ornithology and the Director have long had in mind is one showing by seasons the birds of Golden Gate Park. This would consist of five cases of mounted specimens, the first containing a pair, male and female, of each species of bird known to occur in the Park in the winter, the second case to show the spring migrants, the third the species known to breed in the Park, the fourth the fall migrants, and the fifth case would contain specimens of all the species known to be in the Park *today*. This last would, of course, be a constantly changing assemblage. When a species that was known to be in the Park migrated or disappeared, the specimens of that species would be taken out of the case; when a new arrival in the Park was noted by the observers specimens would be placed in the case. A teacher bringing her class to the Museum could say to them: "The Museum says all the kinds of birds in this case are in the Park today; let us go out and see how many of them we can find".

We have already made a beginning on this exhibit, but collecting the specimens and mounting them requires time and expense. With only one taxidermist progress is very slow. It is hoped that some public-spirited man or woman interested in children may be found who will give the financial assistance needed for the completion of this exhibit which will undoubtedly prove not only of great interest and educational value to

the children of the public and private schools but to adults as well. A sum of money that would enable us to employ two expert collectors and taxidermists for two or three years would be sufficient.

DEDICATION AND FORMAL OPENING OF THE STEINHART AQUARIUM

At the time of the last Annual Report, the Steinhart Aquarium was under construction. Building operations progressed with reasonable speed and were practically completed by the first of July. The stocking of the tanks and pools with fishes and other aquatic life was begun at once, and the dedication and formal opening of the Aquarium occurred on Saturday afternoon, September 29. At 2 o'clock a private view of the Aquarium was given the Trustees, Council and Members of the Academy and the dedication ceremonies were held at 3 o'clock in the court in front of the Aquarium, more than five thousand people being present. The following program was presented:

PROGRAM

MUSIC - - - - - PARK BAND

ADDRESSES:

1. HON. C. E. GRUNSKY, *President of the Academy.*
2. HON. WM. H. CROCKER, *President Board of Trustees.*
3. MR. JESSE W. LILIENTHAL, *Executor Estate Ignatz Steinhart.*

MUSIC - - - - - PARK BAND

4. HON. WILLIAM SPROULE, *Park Commissioner.*
5. HON. JAMES ROLPH, *Mayor, San Francisco.*
6. DR. DAVID STARR JORDAN, *Chancellor Emeritus Stanford University.*
7. DR. BARTON WARREN EVERMANN, *Director of the Aquarium.*

MUSIC - ANTHEM, STAR SPANGLED BANNER

Address by William H. Crocker

No ambition is more laudable than the desire to perpetuate one's name. When this is coupled with the broader plan of benefiting the community in which we live, true philanthropy is achieved.

The fulfillment of this ambition has shown itself in many forms and divers foundations in our country. What could be more beautiful, more instructive and beneficial to the public

at large than the establishment of the Steinhart Aquarium which we are dedicating here today.

It is a moving picture of the wonders of the Deep. From the remote places of the Pacific and Atlantic oceans, their inhabitants, in all their beauty of color and grace of movement, live before us. Think what it means to us, our children and our children's children.

Ignatz Steinhart spent his active life here in San Francisco. He was one of our successful citizens in business. He was inspired by a sense of duty to accomplish something good, elevating and instructive for the present generation with which he lived, and for future generations to come. His name will remain in perpetuity among us; but even better still, Mr. Steinhart will be classed among the benefactors of mankind who have utilized their resources for educational purposes and the betterment of civilization.

Address by C. E. Grunsky

The Steinhart Aquarium which is today being opened to the public has been made possible by the Ignatz Steinhart bequest of \$250,000 to the California Academy of Sciences. The need of an aquarium here has long been felt. How except through the agency of an aquarium shall the general public be made familiar with the life in our streams, lakes, and in the ocean? An aquarium then is educational; but it is more than that. It makes a special appeal because it displays in a convenient way and in attractive environment such a variety of living things. Where else can the movements of fishes and all varieties of aquatic life be so well observed as in the aquarium? Here there is color and form and movement and variety, almost beyond belief; and how easy to learn while being fascinated with the beauty of the scene in the simulated stream or ocean bed?

Some there are at this dedication who will recall the few tanks so long maintained at Woodward's Gardens, on 14th Street near Market many years ago. There was a descent into a cave-like chamber in the walls of which the tanks were placed. Six or eight or more there may have been, I do not remember, but I do recall the great impression which they

made upon me when as a boy, before I knew anything about aquariums, I descended the steps and found myself gazing from the dim light of the cave into a brilliantly lighted tank of sea life.

It hardly seems possible that San Francisco should for such a long time after the passing of Woodward's Gardens have been without an aquarium. The more is this to be wondered at when it is recalled how popular an attraction the aquariums at the Panama Pacific Exposition had proved to be. Crowds were attracted by the exhibit in one of the main buildings and crowds, too, by the marvelous colorful display in the Hawaiian building. Many were the regrets later expressed, that no means were at hand to make such collections of aquatic life permanent.

By reason of geographic position on the shore of the Pacific Ocean, with water upon three sides, and with access by water to California's two great rivers, and as the center of a great metropolitan area, San Francisco is the ideal location for an aquarium of the first rank and is now placed in a position to make a satisfactory display of the life in the ocean as well as in the streams which flow to the ocean. The desirability of an aquarium here was fully realized by Mr. Ignatz Steinhart; as it had been, too, by his brother, Mr. Sigmund Steinhart. The latter, the first to pass away, had left in the hands of his surviving brother a comparatively small fund which was to be used for aquarium purposes if opportunity offered. The former some years before his death began to study aquariums and to weigh the possibility of erecting an aquarium in San Francisco. His interest in this matter led to conferences with Dr. Evermann, the Director of the Museum of the California Academy of Sciences, and with others. The outcome of these conferences crystallized in a desire to have San Francisco give assurance that if some one should erect and equip a building for aquarium purposes, the City would provide operating funds to assure its maintenance and operation. This desire found expression in a charter amendment, adopted by the electors of San Francisco in 1916, to the effect that the City pledged itself to accept an aquarium when constructed and to provide funds for the operation thereof.

After the adoption of this Charter Amendment it was confidently expected that Mr. Ignatz Steinhart would at an early date enter upon the construction of an aquarium. But he was called by death before any definite steps had been taken. In his will, however, he made the provision for the project which we see fully realized today. He bequeathed to the California Academy of Sciences \$250,000 as already stated, to be used in the construction and equipment of an aquarium in Golden Gate Park. The trust thus imposed was, of course, accepted by the Academy. This acceptance was conditioned upon favorable action by the City in the matter of allowing the aquarium to be erected in Golden Gate Park adjacent to the Academy buildings as stipulated by Mr. Steinhart, and the making of provision by the City for the operating expenses of the aquarium. In 1918 the electors passed the necessary charter amendment authorizing the erection and equipment of the aquarium subject to the provisions and conditions named in the Steinhart bequest. Studies were, thereupon, commenced in order that advantage might be taken of experiences elsewhere. Dr. Evermann accompanied by Engineer T. Ronneberg visited the aquariums of the East and brought back much valuable information. The plans for the building were entrusted to Architect Lewis P. Hobart. The result speaks for itself.

On behalf of the Academy, I desire to express at this time the appreciation, by its officers and members, of the cordial cooperation accorded to the Academy and its representatives by the Park Commission of San Francisco, in connection with the construction work and the parking about the building. We have also to thank the California State Fish and Game Commission and Mr. F. A. Potter, Superintendent of the Aquarium at Honolulu for valuable aid in securing fish and other material, and the Southern Pacific Company, the Los Angeles Steamship Company, the Matson Navigation Company, and many other corporations and individuals for courtesies extended and assistance rendered in making collections and in transporting the collected specimens.

I shall not enter upon a description of the aquarium itself which falls properly to its Director, Dr. Barton W. Evermann, from whom you are to hear presently. It is fitting, however,

that we recall the words of the donor whose name the Aquarium bears. I quote from his bequest, as incorporated into the San Francisco Charter amendment which empowered the Board of Supervisors to carry into effect the terms, provisions and conditions of this bequest:

"It being my earnest desire to provide the citizens of San Francisco with an aquarium to be erected in Golden Gate Park of said City, and to be called the 'Steinhart Aquarium'; and provided such an aquarium has not heretofore been constructed or placed in operation by me or any other party or parties; I hereby give, devise and bequeath to the California Academy of Sciences of San Francisco, the sum of (\$250,000) two hundred and fifty thousand dollars, for the erection and completion of an aquarium to be located in the Golden Gate Park of said City of San Francisco, and adjacent or adjoining to the new buildings and museum of said Academy of Sciences in said Park."

"The management, superintendence and operation of said aquarium to be in charge and under the direction of said Academy of Sciences; and I expect that the necessary funds for the maintenance and operation of said aquarium will be furnished by the City of San Francisco for the benefit of the inhabitants thereof or others, who may enjoy said aquarium or derive knowledge and information therefrom."

The Academy, Mr. Mayor, under the terms of this bequest has accepted the trust as set forth, not alone to construct the Aquarium and equip it, but also to operate it for the benefit and enjoyment of all who care to visit it. The Academy desires through you, Mr. Mayor, to advise all who are concerned that the first part of this trust has now been fulfilled. The construction is completed, operation has commenced, and the aquarium, complete and fully equipped, is now ready to be formally opened to the public.

Address by David Starr Jordan

After complimentary remarks concerning the people, the weather and the Aquarium, Dr. Jordan said, in part:

I feel as though I were in a sense a grandfather to the Steinhart Aquarium. Some twenty years ago, Mr. Ignatz

Steinhart came to me to talk over the possibilities of such an enterprise, its cost, its management and the place to put it. All his plans have been faithfully carried out, and in the best possible way. I feel like a grandfather again, because the director of the Aquarium and its superintendent were both students of mine. I taught them to know fish.

It is forty-five years now since Barton Warren Evermann first joined my little student tramping party from Somerset, Kentucky, by way of Cumberland Falls, to the French Broad River, the Great Smoky Mountains, and by way of Tallulah into the heart of Georgia. All along the way we interviewed the flowers, the ferns and the fishes, and the impression has never faded away. We have been working together on fishes ever since those days.

Alvin Seale came to us at Stanford at the end of the last century, when fishing the world over was good. He has been my partner in various investigations and has made many of his own. One notable act was his transfer from Galveston to Hawaii of the mosquito-devouring top-minnow, *Gambusia*, now successfully introduced also in Formosa and the Philippines.

One feature of the Steinhart Aquarium we must not overlook, its value to scientific research. The people of this city, the children especially, will look with wonder and profit on the hundreds of varied forms of fishes; the men of science will make use of them for extending our knowledge of marine life.

The most famous aquarium in the world is the one at Naples. Not for its variety of fishes, for in this regard the Mediterranean cannot compare with Hawaii and the South Seas. It is, however, the center to which hundreds of naturalists all over the world have been drawn for most important studies. This has been because the Aquarium made provision for such study. The upper floor was turned over to Dr. Anton Dohrn, and the great universities of the world were glad and proud to rent "tables" for students, with the equipment of books and instruments of precision which go with each table.

In the Steinhart Aquarium the same provision is made except that the research rooms are in the basement. But they

are equally well provided and the day will come when students of sea-life will cross oceans and continents to work in these hospitable halls.

Address by Barton Warren Evermann

On a sweet day in June, 45 years ago, a young college professor of zoology and a young student of his sat together on the bank of the Cumberland River just below the beautiful Cumberland Falls. The sun shone on the spray, and a rainbow arched the chasm which the river had cut. Beautiful climbing ferns, sensitive briars, orchids and magnolias covered the almost vertical walls that hemmed the river in.

The professor and his pupil saw all these, but they, for the moment, were chiefly interested in a small fish which the student had caught. The professor was giving his student his first lesson in systematic ichthyology. By means of a "Manual of Vertebrates," which the professor had recently written, and which contained descriptions of all the mammals, birds, reptiles and fishes then known from the eastern United States, the little fish was soon identified as the common stone-roller or dough-belly, whose scientific name is *Campostoma anomalum*; "anomalum," because its very long intestine is wound around its air-bladder, like the wire or string around a leaky garden hose to keep it from bursting—a structure quite "anomalous" among fishes.

In the weeks that followed, while tramping southward through Kentucky, Tennessee, North Carolina and Georgia, across the Cumberland Mountains and the Great Smokies, the professor and his student had frequent opportunity to take a look at the fishes in the streams they crossed. They sat on the banks of many of them—as the French Broad, the Swannanoa, the Tallulah and the Tugaloo, and studied and identified such fishes as they had caught. And thus the student's interest in fishes grew day by day.

Since those glorious days, the professor and his student have fished together in many waters, both fresh and salt, and

in many lands. They have caught fish, usually while fishing together, in every state and territory in the Union, and in some foreign countries. They, sometimes alone, sometimes with others helping them, have waded a hundred miles or more, in rivers, lakes and along ocean shores, through which they dragged nets with which to catch the fish.

Sometimes the "water was fine" and felt very pleasant; sometimes it was very cold and felt very different; but it was always *wet!* One occasion is recalled when they fished in a certain icy-cold river in Colorado whose name is Rio de las Animas Perdidas, or the River of the Lost Souls.

After a hasty inspection the professor decided that the best place to draw the seine was on a gently sloping gravel bar on the opposite side of the river, and said, "We will wade across and try it over there." There was a bridge only a few yards above us, and the three other members of the party said, "Why not cross on the bridge?" But, despite their protest, the professor gathered up one end of the seine, Davis the center, Fesler the other end, the other the collecting bucket, and we all started across, stepping from stone to stone where the water was deep. Soon the professor slipped and went in over his head! Scrambling back to shore as best he could, he remarked, between shivers, "I always thought that the place where lost souls went was a good deal hotter than this place is." We all then went up and crossed on the bridge.

On another occasion we went from Salt Lake City down into the Land of Juab where we fished the Sevier River. The professor had inadvertently left his seining clothes at the hotel, so he said, "You boys can do the seining today; I'll stay on the bank and boss the job and examine the catch as you bring it ashore." Fishes of several very interesting kinds proved abundant, and the professor became greatly excited. He disappeared for a moment in the bushes, but soon reappeared garbed only in a hat and a long linen duster, with the remark, "This is great! I want to share the fun with you boys."

We got many kinds of fishes in that interesting stream, and, as we drove back to Juab in the cool of the evening, we

commemorated the event by fabricating and singing a "round" (a parody on "The Animal Fair"), which ran something like this:

We went to the fisheries fair,
The suckers and chubs were there;
And old Cottus blob with a red corn cob
Was combing the bullfrog's hair.
Pantosteus he got drunk
And fell on Agosia's trunk,
Rhinichthys sneezed
And fell on his knees,
And that was the end
Of the Blob,
blob,
blob.

With these many years of intimate association with Dr. David Starr Jordan in the study of fishes, it was quite natural that I, his student, should develop an interest in live fishes as well as fishes preserved in alcohol. So, in 1916, when some one told me that Mr. Ignatz Steinhart, a public-spirited citizen of San Francisco, was also interested in fishes and aquariums, I determined to meet him.

Through a mutual friend, the late Rudolph J. Taussig, I first met Mr. Steinhart on March 8, 1916. Mr. Steinhart spoke freely of his long interest in public aquariums and the interest of his brother Sigmund Steinhart; how he had dreamed for years of establishing a public aquarium in San Francisco; how he had visited all the aquariums in America and Europe; how he had employed experts to study aquarium problems and assemble data for him; how he had made propositions to various individuals and organizations to join him in the undertaking; how he had met with one difficulty and rebuff after another, until finally he had become so discouraged that he abandoned the idea entirely and decided to devote his money to an entirely different purpose. His decision seemed to be final; and I left Mr. Steinhart that evening with the feeling that there was no hope that he would ever put any money into an aquarium.

Two days later Mr. Steinhart phoned me to come and take luncheon with him at the California Market. I did so and he at once said that he had been thinking about the aquarium

matter and wished to ask some questions, particularly as to the amount of money that would be necessary to provide an adequate building adequately equipped, what should be the scope and character of the aquarium, the best location, under what management it should be placed, who should provide the funds for maintenance, and many other details.

Among other things I told him about the great New York Aquarium which was established by the City of New York, the management of which was soon transferred to the New York Zoological Society, a private corporation.

To make a long story short, other conferences followed at brief intervals, and on April 5 Mr. Steinhart told me he had decided to provide an aquarium, provided it could be located in Golden Gate Park and placed under the management of the California Academy of Sciences, which I had assured him was essentially the same sort of an organization as the New York Zoological Society. He stated that he would put \$75,000 to \$100,000 into it and would leave in his will a similar amount for enlargement.

Among those who had much to do with Mr. Steinhart's reaching this decision was Mr. E. O. McCormick, vice-president of the Southern Pacific. On one occasion Mr. Steinhart and Mr. McCormick visited the Park together to consider various sites, and Mr. McCormick then suggested essentially the site which the building now occupies. Mr. Leon Greenebaum, an intimate friend of Mr. Steinhart and an enthusiastic angler, also had much to do in giving Mr. Steinhart counsel and encouragement.

On September 21, at a luncheon at the Palace Hotel at which Mr. McCormick presided, Mr. Steinhart made the first public announcement of his intention to provide the funds for an adequate building adequately equipped, provided (1) that the aquarium be located in Golden Gate Park, (2) that it be under the management of the California Academy of Sciences, and (3) that the City of San Francisco or some other institution supply the funds for maintenance.

From that moment the matter moved rapidly—the adoption of a charter amendment authorizing the board of supervisors to appropriate funds for the maintenance of an aquarium, Mr. Steinhart's intention to begin construction work early in 1917,



STEINHART AQUARIUM OF THE CALIFORNIA ACADEMY OF SCIENCES



IGNATZ STEINHART (1840-1917)
FOUNDER OF THE STEINHART AQUARIUM
OF THE
CALIFORNIA ACADEMY OF SCIENCES

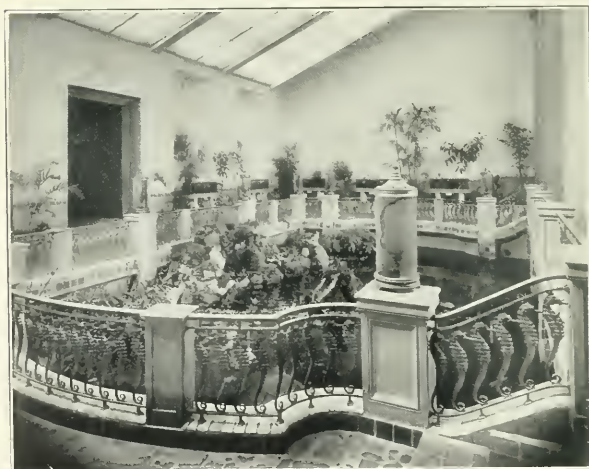


THE SWAMP ROOM OF THE STEINHART AQUARIUM

It is approximately 58 feet by 60 feet. In the center of the room is a swamp 24 by 40 feet, in which are shown many species of aquatic animals, including alligators, frogs, turtles, salamanders and water snakes; also aquatic plants. Around the swamp are two series of balanced aquariums which are very attractive and interest the public greatly.



A PORTION OF THE SWAMP ROOM IN THE STEINHART AQUARIUM



ANOTHER VIEW OF THE SWAMP IN THE STEINHART AQUARIUM
Note the artistic railing around the swamp

his sudden death May 15, 1917, and the announcement that he had left in his will \$250,000 to the California Academy of Sciences for an aquarium building and its equipment.

The executors paid the \$250,000 to the Academy December 17, 1919. Immediately thereafter the architect's engineer, Mr. Trygve Ronneberg, and I went east and visited all the aquariums in America, and in the summer following I visited that at Honolulu. The knowledge gained from a study of these aquariums was of great value in our planning of the Steinhart Aquarium. When the \$250,000 was paid to the Academy (December 17, 1919) building conditions were not good, so the trustees loaned the money at a good rate of interest payable monthly. Whenever a monthly interest payment was received government certificates were bought with it. As a result something near \$55,000 in interest has now been received, and we have put \$305,000 instead of \$250,000 into the building and its equipment. Building operations began April 1, 1922, and you now see the building practically completed.

In certain features the Steinhart Aquarium is the most complete and satisfactory of any in this country.

We have four kinds of water—fresh water of the local temperature for local freshwater fishes and similar species; fresh water cooled to meet the needs of trout, salmon and other cold water species; salt water of the local temperature for local and other salt-water species suited to that temperature; and salt water warmed to meet the needs of fishes from the Hawaiian Islands and elsewhere in the tropics.

There will be upwards of 110 tanks, large and small, and large outdoor pools. One unique feature is a large indoor tropical swamp stocked with various species of turtles, frogs, water snakes, salamanders, alligators and aquatic plants. Around the tropical swamp are two series of balanced aquariums which are very beautiful and interesting.

Another unique feature is a fish-hatching equipment where an expert detailed by the State Fish and Game Commission will demonstrate the methods of fish culture. Still another unique feature is a well-equipped biological laboratory in which college professors, high school teachers, students and others can carry on investigations of any problems of aquatic

life that can be studied from aquarium material. It is expected that this laboratory will prove of real value to the public schools.

The aquarium employs what is known as the closed circulation system: the water being stored in large reservoirs from which it is kept circulating through the aquariums, the same water being used over and over again for years.

The object has been to carry out the wishes of Mr. Steinhart by providing an aquarium that will be of the broadest general interest and that will be of the highest educational value to the city and the state. To what extent this aim has been realized you can judge when you enter the aquarium.

The staff has now been selected and the aquarium is in operation. We are fortunate in having secured as superintendent in immediate charge of the aquarium Mr. Alvin Seale, who built the Manila Aquarium, which he operated for several years. As principal expert assistants to Superintendent Seale we have secured Mr. H. Walton Clark, for many years connected with the United States Bureau of Fisheries, and Mr. Wallace Adams, as assistant superintendent.

That this occasion is a very happy one for me will be believed. It marks the realization of an ambition that has possessed my soul for many years. And I can repeat what I have often heard Dr. Jordan repeat from good old Izaak Walton: "It is good luck to any man to be on the good side of the man who knows fish." And I may add, it is good fortune for any man to have "walked with Jordan," and doubly blest is he who has *fished* with Jordan.

And as we are assembled here today, my thoughts go back to that delicious day at Cumberland Falls 45 years ago. The wax was soft then and the impress grew indelible. I see again the whole scene—the great silvery waterfall, the broad sheets of white and green water pouring over the precipice to lose themselves in the swish and swirl of the great cauldron at the base; the spray filling the gorge, the spray-washed and diamond-studded ferns and moss and shrubs on the walls, the gorgeous masses of flowers, the mist rising above the gorge and gleaming in the sunlight, and the rainbow arching all.

The professor and his pupil sit together here again today. In imagination they have reached the rainbow's end, and they

have found, not the mythical pot of gold, but something of vastly greater interest and value to you and me and all the people of California—this beautiful aquarium, this splendid enduring memorial to Ignatz Steinhart, erected, in the felicitous words of the donor, “for the benefit of the inhabitants of San Francisco and others who may enjoy said aquarium and derive knowledge and information therefrom.”

Would that Mr. Steinhart could be with us here today and enjoy with you and me and all of us, and that all of us might enjoy with him, the fruition of his dream.

Numerous letters and telegrams that had been received from institutions and individuals in various parts of the United States and elsewhere conveying felicitations and congratulations were read, a few of which may be mentioned:

Luther Burbank; Riverside Public Library; Duncan Burnet, librarian, University of Ga.; Jarl Lindfari, vice-consul of the Republic of Finland; Iowa Geological Survey; U. S. Naval Observatory; William McInnes, Director Victoria Memorial Museum; American Philosophical Society; Professor Henry Fairfield Osborn, President, Am. Mus. Nat. Hist.; President, Univ. of Mich.; Dr. J. N. Rose, U. S. N. M.; Dr. Charles D. Walcott, Secty. Smith. Inst.; Dr. E. J. Allen, Director Marine Biological Assn. of the United Kingdom, Plymouth, England; President of the Tokyo Imperial University; C. Anderson, Director, Australian Museum, Sydney; Académie des Sciences de Russie; Botanischer Verein de Provinz Brandenburg; Dr. Charles H. Townsend, Director, New York Aquarium.

AQUARIUM PERSONNEL

The personnel of the Aquarium is as follows:

Dr. Barton Warren Evermann, Director, part time; W. W. Sargeant, Secretary, part time; Susie M. Peers, Secretary to the Director, part time; Mrs. Constance W. Campbell, stenographer and typewriter, part time; Alvin Seale, Superintendent; Wallace Adams, Assistant Superintendent; H. Walton Clark, Aquarist and Chief Collector; William J. Martin, Assistant Collector; Clynt S. Martin, Chief Engineer; Frank Terlin, Assistant Engineer; John R. Moorefield, Assistant Engineer; H. F. Stevens, Relief Engineer; Charles Brandt, Chief Attendant; W. S. Walker, Assistant Attendant; Clyde E. Guidry, Assistant Attendant; Peter J. Burke, Janitor; Patrick O'Neill, Assistant Janitor; S. J. Shenefield, Carpenter; and Lucie Hicks, Door Attendant.

COMMITTEE ON CONSERVATION OF WILD LIFE

This is one of the Academy's most active committees. Its membership consists of M. Hall McAllister, chairman; Barton Warren Evermann, W. B. Lewis, John R. White, and S. Leonard Abbott.

Among the most important achievements of the committee may be mentioned the following: The Academy's Conservation Committee was appointed to act as the California or Pacific Coast representative of the Permanent Wild Life Protection Fund of New York, Dr. W. T. Hornaday, Trustee. Through the Academy's Special Observers, the Committee has distributed considerable conservation literature and given much publicity to conservation matters.

The Committee also makes and publishes an Annual Census of certain large mammals in California.

The census for 1923 was as follows: Valley Elk, 468 animals; Mountain Sheep, 212 animals; Antelope, 1007 animals.

Valley Elk—An occasional visit is made to the herd in Kern County, where the animals live an undisturbed life among the willows and tule lands bordering Buena Vista Lake. The Academy caught up and distributed in 1914 and 1915 about 166 Valley Elk from this herd. The herds giving most promise are those in the paddock in the Yosemite Valley, which now number eleven head, and, that on the Monterey peninsula, which number about thirty.

The animals were placed in the following reservations or parks: Balboa Park, San Diego; J. M. Danziger property, Santa Monica Mountains, Los Angeles County; E. L. Doheny property, Santa Monica Mountains, Los Angeles County; City Park, Riverside; Modesto City Park, Modesto; California Redwood Park Association, Big Basin; Seventeen-mile Drive, Monterey; Santa Cruz City Park; Alum Rock Park, San Jose; Mooney Park, Visalia; Fresno City Park; A. V. Lisenby Park, Friant; P. H. Loinaz Park, Fresno; John Zapp Park, Fresno; Vancouver Pinnacles; J. F. Dunne Park, San Felipe; Del Paso Park, Sacramento; City Park, Petaluma; Eden Valley, Mendocino County; and the Yosemite Valley.

Mountain Sheep—These animals live in the inaccessible desert mountains of southern California. The Committee has

had posted a number of metal signs of WARNING and REWARD on or near their habitat.

One law-breaker was arrested and fined \$100 for killing two sheep in the Southern Sierra and our first \$50-reward was paid to the informer.

Antelope—The Mount Dome Herd in Siskiyou County, northern California, which numbers over 100 animals, has been our special care. They are now ranging in their usual habitat in the Modoc Lava Beds. The Committee has also posted all the Antelope country with metal warning signs and endeavors by reasonable publicity to give these animals all protection possible. It might be noted that the U. S. Biological Survey joined with a private subscription of \$1000—(made by a member of the Academy) and a fund was raised which was used to capture in northwestern Nevada some 40 antelope fawns. This herd is now being held in Reno, Nevada, and will shortly be transferred to their permanent home on the Tonto Plateau in the Grand Cañon of the Colorado in Arizona.

Subscriptions—The following amounts have been received during the year for use of the Conservation Committee:

Permanent Wild Life Protection Fund..	\$300
American Bison Society.....	100

SPECIAL WILD LIFE OBSERVERS

CALIFORNIA ACADEMY OF SCIENCES, SAN FRANCISCO

1. Albright, Horace M.....Superintendent, Yellowstone National Park, Wyoming.
2. Anthony, Alfred W.....237 Spruce Street, San Diego, California.
3. Courtright, George W....Malin, Klamath County, Oregon.
4. Cuthbert, Edmund R....David, Chiriqui, Panama.
5. Durbin, William G....Susanville, Lassen County, California.
6. Eakin, J. Ross.....Superintendent, Grand Canyon National Park, Grand Canyon, Arizona.
7. Hedderly, Edwin A.....Pacific Finance Building, Los Angeles, California.
8. Hutchings, H. W.Acting Superintendent, Glacier National Park, Belton, Montana.
9. Jaeger, Edmund C.....Director, Riverside Junior College, Riverside, California.
10. Karstens, Henry P.....Superintendent, Mount McKinley National Park, McKinley Park, Alaska.

11. Lee, William J. Susanville, Lassen County, California.
12. Lewis, Washington B. Superintendent, Yosemite National Park,
Yosemite, California.
13. Miller, John O. Tennant, Siskiyou County, California.
14. Ober, Edwin H. Big Pine, Inyo County, California.
15. Russell, Carl P. Park Naturalist, Yosemite, California.
16. Sanson, N. B. Banff Museum, Banff, Alberta, Canada.
17. Shay, Arthur T. Upland, San Bernardino County, California.
18. Thomson, Charles Goff. . . . Superintendent, Crater Lake National Park,
Medford, Oregon.
19. Tomlinson, Owen A. Superintendent, Rainier National Park, Ash-
ford, Washington
20. White, John R. Superintendent, Sequoia National Park, Se-
quoia, Tulare County, California.

DEPARTMENT REPORTS

DEPARTMENT OF BOTANY

Following is a statement of the approximate number of species and specimens in cases in the Herbarium at this date.

	Species	Specimens
General collection in 68 cases	42,288	122,852
Mosses	1,511	3,826
Hepatics	180	562
Lichens	849	1,541
Algæ (Prager Herbarium)	614	614
Fungi " "	3,656	3,656
Ferns " "	985	985
Cereals " " (Hohenacker collection)		172
	50,083	134,208

The number of specimens in the Prager Herbarium is still unknown as the catalog which came with the herbarium, lists species only and many species are represented by specimens from different regions. The algæ, ferns and fungi are in the original packages and only the catalog has been used in numbering species and specimens. When we are able to stamp and number every specimen sheet in the herbarium an exact report can be obtained; probably the number of specimens is at least 150,000. The boxes of microscope slides are also unlisted. These specimens consist of diatoms, mosses and fungi beautifully mounted.

The most important accessions during the year have been as follows: 407 specimens of flowering plants donated by Ellsworth Bethel of the Colorado State Museum, collected chiefly in Shasta County, California, while engaged in the Blister Rust Investigation; 1178 specimens from southern China and Siam collected under the auspices of the Canton Christian College and obtained from Walter T. Swingle in exchange; 418 specimens, chiefly exotics, donated by Eric Walther and collected by him in gardens and parks in the San Francisco Bay Region, Santa Barbara and Monterey; 850 specimens from the National Herbarium in continuation of exchange; 229 specimens from southern California, sent by Philip A. Munz, from the Baker Herbarium, Pomona College, Clare-

mont, California, in exchange; 351 specimens of trees and shrubs from the Arnold Arboretum in continuation of exchange; 189 specimens donated by Mrs. Charles W. McKelvey collected in Glacier National Park and the Atlantic States.

More than 50 individuals have contributed specimens chiefly for identification. Their names will appear on the list of donors. The Curator collected as follows, not including mosses which are listed separately: Angels Camp, Calaveras Co., 106; Shasta Springs, Siskiyou Co., 121; Mt. St. Helena, 45; Mt. Hamilton and Mt. Diablo, 24; Yosemite Valley, 53; Del Norte Co., 400; Humboldt Co., 41; Point Reyes, 56; Lower California, 96; Los Angeles, 14; Santa Barbara (exotics), 44; a total of approximately 894 specimens not including many duplicates.

The collection of mosses has been increased by almost 500 specimens. Miss Anna Head collected in the Feather River Region, Mrs. Enid Michaels in the Yosemite Region, Mrs. E. C. Sutcliffe and Mrs. Marian L. Campbell in Marin Co., Mrs. S. E. Hirstel in Yosemite Valley, and Miss Stella Handelin at Eureka, Humboldt Co. Mr. R. E. Bradshaw of Palo Alto has donated 18 fine specimens named by authorities. The Curator has collected about 400 specimens of mosses wherever collections of other plants have been made and especially in Marin Co. on Mt. Tamalpais and in Mill Valley. These collections are mostly undetermined. Some are now in the hands of specialists; others will be sent later and none is as yet incorporated in the general collection.

Besides collecting mosses, Mrs. E. C. Sutcliffe has taken charge of our collection of Hepatics, sending the fresh collections to Professor Alexander W. Evans at Yale University for determination. There have been added two genera and three species to the known flora of California. She has donated 30 specimens received in exchange from Miss C. C. Haynes, Highlands, New York.

The collection made by Ivan M. Johnston in Lower California on the expedition of the California Academy of Sciences in 1921 has been mounted and incorporated into the herbarium. There are 1418 specimens of flowering plants and ferns including 46 types of new species and subspecies. The collection of Algæ is a notable one, containing 122 specimens and including 55 types. This collection will form the basis of a paper on the Algæ of Lower California by Dr. W. A. Setchell and Dr. N. L. Gardner, now in press.¹ They have added to the collection two types collected by Walter E. Bryant on an Academy Expedition many years ago and 5 types collected by T. S. Brandegee. There are also 12 cotypes from the collection of Mrs. Marchant.

The duplicates of the flowering plants and ferns of the Johnston collection have been labelled and arranged in six or seven sets, each set having also been listed. These sets will be sent to the most important herbariums for exchange when Johnston's paper has been published and distributed. There are 3472 duplicates.

The herbarium donated by Professor George R. Kleeberger has also been incorporated into the herbarium. Besides the valuable collection of mosses and hepatics there are 3293 mounted and 2256 unmounted specimens. It includes a valuable numbered set of plants collected by Kellogg and Harford

¹This report has been published as Proc. Calif. Acad. Sci., Vol. XII, No. 29, pp. 695-949, pls. 12-88, map.

in 1868-69, containing duplicates of types and part of the collections on which the Botany of the California Geological Survey was founded; also a collection from the herbarium of D. C. Eaton, specimens collected in Utah on the Clarence King Exploration of the 40th Parallel. The donor's own collections in Connecticut, Wisconsin and California add to the great value of this herbarium.

The exhibition of flowers, both native and exotic, which is maintained in the vestibule of the Museum is one of the most popular features of the Museum and has great educational value. Each specimen is labelled with the scientific and common name and, in the case of the native flowers, the locality, while the native country is given with the exotics. More than a thousand species are on exhibition during the year, as there is continual change. Some good friends of the Academy have been of great assistance in sending or bringing specimens. Mr. W. P. Steinbeck of Stockton has sent beautiful flowers from the Sierra Nevada almost every week during the flowering season, Mrs. E. C. Sutcliffe and Mrs. S. E. Hirstel have brought in lovely specimens from Marin Co.; while Eric Walther has contributed almost all the exotics, a most important part of the exhibition. Mrs. Johanna Wilkens has been as usual most efficient in keeping the exhibition clean and in good order.

My assistant, Mrs. George H. Phelps, has done excellent work in mounting the numerous accessions and distributing them into the herbarium. The evening class of the gardeners and the Botanical Club have had regular meetings and excursions. Popular talks on botanical subjects and conservation have been given to various clubs and the influence of the Academy thereby extended. The list of trees, shrubs, and hardy perennials in Golden Gate Park has been completed and will soon be published in the Report of the Park Commissioners. This list has been prepared by Eric Walther under the supervision of John McLaren, Superintendent of the Park. The determinations have been made by the Curator. There are 125 families, 569 genera, 1679 species and 788 varieties, making a total of 2167 labelled specimens. This work has taken a great deal of time and its success is due to the untiring efforts of Eric Walther.

A catalog of the exotics cultivated out-of-doors in California would be a most useful and illuminating publication and could be made from the fine collection now in our herbarium.

My greatest need is more help as my time is taken up altogether with curatorial work that cannot be done except by a botanist.

Alice Eastwood, *Curator*.

DEPARTMENT OF ENTOMOLOGY

Work in the Department of Entomology in 1923 was characterized more by the development of the material on hand than by extensive additions. Circumstances made it inadvisable for the curator to do the usual amount of field work but more was accomplished in the mounting of accumulated material and the determination and arrangement of the unworked species. Dr. F. E. Blaisdell continued his work on the Academy collection of Coleoptera, and a number of difficult and interesting families of beetles have been gotten into shape and await the purchase of the necessary cases for their arrangement. Dr. F. R. Cole completed a second installment of his report on the Diptera of the Gulf Expedition, covering most of the families except the Bombyllidæ reported on

in 1922, and in October, at considerable personal sacrifice he spent three weeks at the Academy working over the dipterous insects accumulated during the past two years, thus making possible the rearrangement of our entire collection of the two-winged flies. During the early part of the year Prof. T. D. A. Cockerell completed work on four families of the bees of the Gulf Expedition, and after his return from Siberia, he completed six more families. These studies on the bees show a large percentage of new forms among the Mexican material (64 out of 106 being new) and greatly enhance the value of this portion of the Academy collection of insects. Mr. C. D. Duncan completed the study of the Academy material in the Vespidae, including the hornets and yellow-jackets, and Mr. C. L. Fox studied the digger wasps of the Family *Bembecidae*. Mr. Morgan Hebard finished his work on the orthoptera of the Gulf Expedition. Mr. Ralph Chamberlin that on the spiders and millepedes, and Mr. Joseph Chamberlin that on the pseudoscorpions. Finally, the curator was able to devote some time to systematic work on the North American Hemiptera, completing work on the Chermidae and nearly completing that on the Cicadellidae. Dr. E. C. Van Dyke, who each year adds largely to the collections of the Academy, spent the whole year in China where he again made extensive collections of insects for the Academy of Sciences. This material did not reach us until too late for inclusion in this report but will be fully covered in the report for next year.

Accessions to the Department of Entomology in 1923 number 13,045 specimens slightly fewer than in the preceding year.

Field work by the curator included a week spent at Potholes, California, and Yuma, Arizona, in April, a week in Mill Creek Cañon, San Bernardino Mountains, in September, as the guest of Dr. F. R. Cole and his parents, and about four days' work at Ensenada, Lower California, and Alpine in San Diego County, in September, one day at Mt. Diablo in May and one day at Pittsburg, California in November, as the guest of Mr. and Mrs. J. O. Martin. The total number of insects added by this field work is 4630. Other important accessions are: From F. F. Crevecoeur, 1541 beetles from Kansas, in part purchased; Mr. J. A. Kusche, 1322 specimens, mostly exotics, purchased; Mr. Clifford Dodds, 1241 insects from Mexico, in addition to those recorded last year; Mr. J. O. Martin, 719 specimens, including many rare forms and the types of seven species of beetles described by him; Mr. C. L. Fox, 619 insects, largely from the Sequoia National Forest; Mr. Louis Slevin, 509 specimens from Monterey Co., California; Dr. F. E. Blaisdell, 362 insects, including types and a valuable series of western cicadas; Mr. Herman Peters, 360 specimens from Queensland, recorded but not enumerated in our report for 1916; Mr. E. R. Leach, 197 insects; Mrs. H. E. Ricksecker, 183 insects from California; Miss Louise Knobel, 182 insects from Arkansas, purchased; Mr. B. C. Marshall, 148 beetles from Arkansas; Mr. J. R. Slevin, 136 insects taken in field work in Lower California; Mr. A. Christoffersen, 125 insects from the Pribilof Islands; Mr. F. R. Jones, 44 insects; Mrs. S. A. Anderson, 21 insects from Columbia, some of them large and interesting forms; Dr. C. H. Kennedy, 228 dragon-flies, mostly from California, and all correctly determined. Other smaller donations were received from various friends of the Academy and from Mr. George P. McNear, a complete set of the 10 volumes of *L'Echange*, a rare entomological journal published in Paris.

During a part of the year the curator was fortunate in having the help of Mr. J. O. Martin. This made possible the mounting and labelling of all material secured during the year and of much that had accumulated during previous years.

One gratifying feature of the Academy activities directly related to the Department of Entomology was the publication of 17 papers on the entomological results of the 1921 Expedition to the Gulf of California. These papers already fill 388 pages of the Academy Proceedings and enumerate 710 species and subspecies, of which 284 are new to science. Two other completed papers now await publication and there are several groups of insects still to be studied including the balance of the Coleoptera, Hymenoptera and Lepidoptera, the Neuropteroid insects and a few Diptera.

Another interesting feature of the work of this department is the growth of the collection of type specimens of insects. These now number 1383 holotypes and allotypes and include the holotypes of probably 800 or more species of insects. Unfortunately the types of most of our western insects have been taken by commercial collectors and sold to eastern museums where they are quite inaccessible to western students. This condition is quite paralleled by that formerly existing in the east where so large a proportion of the species were sent to Europe in earlier years and now the student of eastern insects must cross the Atlantic to examine the types of many of his species, an undertaking comparable to the trip to the east required of our western students. In both cases it is a serious handicap to entomological work. The feeling formerly existing that most serious entomological work is done in the east and therefore the types should be preserved there, no longer holds good. The California Academy of Sciences is doing its part in supplying storage facilities, as safe as they can be made, and in encouraging the placing of the types of western insects in western museums where they will be of most service to science. It is to be hoped that in time a broader view of the field on American entomology will induce eastern workers to place the types of western species that may come into their hands in western museums where they will be accessible to workers in that fauna.

EDWARD P. VAN DUZEE, *Curator*

DEPARTMENT OF EXHIBITS

As all of the space for large habitat groups is occupied, the work in the exhibition halls is necessarily confined to the installation, in the panels between the large ones, of more of the smaller groups. Four of the latter have been installed during the year by the chief taxidermist, Mr. Frank Tose, as follows: Ring-tailed Cat (*Bassariscus astutus raptor*); Allied Kangaroo Rat (*Dipodomys merriami simiolus*), Burrowing Owl (*Speotyto cunicularia hypogaea*), and Sierra Golden-mantled Ground Squirrel (*Callospermophilus chrysodeirus chrysodeirus*). Two panels were arranged to display seal skins in successive stages of preparation.

In addition to this work three additional portable groups for school use have been arranged, and construction begun upon others. There is constant demand for these groups, and more will be constructed as opportunity presents.

Mr. Tose has also done some exchange work with other departments, such as: the installation of the group of Northern Elephant Seal (*Macrorhinus angustirostris*) in the Steinhart Aquarium, the making of casts of a huge turtle for the Department of Herpetology, and the tanning of a number of large mammal skins, many of which really belonged in the Department of Mammalogy.

Material for this department has been received as follows: *By exploration*, 41 specimens. *By gift*: John McLaren, 1; W. M. Phillips, 2; J. S. Scupham, 2. *By purchase*: 3 specimens.

JOSEPH MAILLIARD, *Curator*.

DEPARTMENT OF HERPETOLOGY

At the beginning of the year 1923 the Academy's collection of reptiles and amphibians numbered 51,006 specimens. There have been added during the year 2132 specimens, so that the collection has grown to 53,138 specimens.

The number of specimens added during each of the past six years has been about as follows: In 1918, 1724 specimens; in 1919, 2666; in 1920, 1466; in 1921, 5002; in 1922, 4934; and in 1923, 2132 specimens.

Gifts of specimens during the year have been received as follows: From Frank Arundell, 4 specimens; H. L. Mason, 1; Prof. H. M. Hall, 14; Steinhart Aquarium, 44; J. L. Hitchcock, 1; L. M. Klauber, 213; S. F. International Fish Co., 1; H. P. Losing, 1; Mrs. E. C. Sutcliffe, 1; Don P. Johnston, 1; Frank Stevens, 3; Dr. L. A. Draper, 1; and Dr. E. C. Van Dyke, 32.

Specimens have been secured from 12 counties of California, as follows: Imperial, 24 specimens; Lake, 1; Los Angeles, 4; Marin, 1; Orange, 29; Riverside, 86; San Diego, 448; San Luis Obispo, 11; Santa Barbara, 12; Sonoma, 1; Tuolumne, 15; and Ventura, 38.

Specimens from other localities are: Alabama, 1 specimen; Arizona, 21; Florida, 5; Indiana, 4; Iowa, 1; Michigan, 1; New York, 23; North Carolina, 6; Texas, 4; Utah, 1; Washington, 207; Africa, 2; Asiatic Russia, 2; Australia, 101; Bonaire Island, 3; Brazil, 2; China, 45; India, 1; Japan, 4; Mexico, 856; Pacific Ocean, coast of Calif., 1; Philippine Islands, 170; South America, 1; West Indies, 3.

Descriptions of five new species and subspecies of snakes from Mexico and Asia were published in the year.

Through the courtesy of Professors Alfonso L. Herrera and José Maria Gallegos, the Curator and Assistant Curator, in the early summer were the guests of the Mexican Government on an expedition to the San Pedro Martir Mountains in northern Lower California. During the period of preparation for this expedition to the mountains collections were made in San Diego, Imperial, Orange, Riverside, and Los Angeles counties, California, and on the Todos Santos Islands in Lower California. This field work resulted in 1327 specimens of reptiles and amphibians, of which four snakes were new to science.

JOHN VAN DENBURGH, *Curator*.

DEPARTMENT OF INVERTEBRATE PALEONTOLOGY

At the close of 1922, Mr. Frank M. Anderson and the curator were busily engaged in the task of preparing a report on the Eocene invertebrates found at the type locality of the Tejon Group in Kern County, California. The work was finished early in the year and the paper awaits an opportunity for publication. It is one of the most comprehensive papers thus far prepared in the department.

The completion of this task cleared the way for Mr. Anderson to proceed with his studies of the paleontology of Colombia, South America, and reports on the large collections which were donated to the Academy were in course of preparation at the end of the year.

When the work on the Tejon Eocene was finished the curator began to devote such time as he was free from routine duties to the study of the fossil microorganisms of the western sediments. In May an arrangement was made with the Pacific Oil Company and its associates whereby half-time was devoted to the microscopical study of sediments from its oil wells and the application of the information thus obtained to economic problems. The remainder of his time was devoted to purely Academy duty or research. The arrangement proved very satisfactory to all concerned. A full time assistant was provided by the company. Mr. Roy T. Hazard filled the position until he returned to the University of California in August. He was followed by Mr. H. L. Driver who continued to the end of the year. All work was done in the laboratories of the Academy. In a few months it resulted in the accumulation of a very large collection of microscopical material. New equipment was installed and methods of study devised which greatly facilitated the work. The department became an exceedingly busy place and is now the headquarters for such work in the west. Students and professors of both neighboring Universities sought and were given assistance on a great many occasions.

The reduction of Academy time and expense of the curator through the above mentioned arrangement permitted the employment of a full time assistant in the Academy work and the return to the general fund of a considerable part of the original expense appropriation allotted to the department. Mr. Merle C. Israelsky filled the position of assistant very creditably and much valuable work was accomplished during the remainder of the year.

From time to time Mr. William Barbat was temporarily employed in the department and he completed most satisfactorily the arrangement of the vast collection of Gulf of California marine shells. This collection is now stored in such a way that it is readily accessible in any part. Dr. Fred Baker of Point Loma, California, continued his studies of the collection but the final report may not be expected before the close of 1924, owing to the huge task which confronts him.

The field work which was carried on was largely in connection with microscopical studies but considerable collections of higher organisms were obtained at various places in California. The Academy was put to practically no expense in this connection.

Two accessions during the year deserve special mention. Three hundred species of named fossils from Europe were obtained in exchange for minerals from Mr. R. W. Wilke of Palo Alto, California. A very large and accurately

labelled collection of California fossils consisting of many thousand specimens was donated by the Southern Pacific Company.

Outstanding loans of material for scientific study from the department at the close of the year were as follows:

Professor Bruce L. Clark, University of California, Berkeley, Fossil mollusks from the Tertiary; Dr. Mary J. Rathbun, U. S. National Museum, Washington, D. C., Fossil crustaceans from Western Tertiary; Dr. Paul Bartsch, U. S. National Museum, Washington, D. C., Marine shells from the Galapagos Islands; and Mr. Donald Hughes, Stanford University, Pleistocene Foraminifera from Lomas, California.

G. DALLAS HANNA, *Curator.*

LIBRARY

Work in the library of the Academy during the year 1923 was largely of a routine nature. All books received were accessioned, cataloged and properly shelved, and periodicals and exchanges were collated and arranged on the shelves with the series to which they belong. The task of collating and arranging the accumulated material pertaining to Education, Engineering, Astronomy Meteorology, Physics and a few related subjects, was completed, thus placing the collection of material in the lower library room in shape for convenient use.

During the summer a considerable number of duplicate volumes in the library storeroom was transferred to the library of the Steinhart Aquarium as a loan, where it will be of service in strengthening the library facilities of that department of the Academy's activities.

The total number of volumes added during the year was 357, of which 44 were secured by purchase, 251 by exchange for the publications of the Academy, 39 were added through subscription to scientific serials and 23 were received by gift. This enumeration does not include pamphlets and excerpts of which many were received, mostly as gifts. It is gratifying to note that the Academy is now receiving regularly its exchanges from nearly all countries in the war zone, including Russia, these receipts embracing most or all the back numbers issued since their interruption in 1914.

Use of the library by the Academy staff has increased during the past year as has that by the general membership. More use has also been made of the privilege of inter-library loans which has materially supplemented the resources of the Academy library.

As during the preceding year the work in the library has been done by Mrs. Helen Van Duzee with some assistance during the later weeks of the year from Mr. Dean Burk, both of whom have rendered efficient service.

EDWARD P. VAN DUZEE, *Assistant Librarian.*

DEPARTMENT OF MAMMALOGY

Work in this department is carried on in conjunction with that of the Department of Ornithology and by the curator of the latter, so that the field work covers the same territory in both cases.

When the present curator took charge, there was a large accumulation of unprepared osteological specimens, for which there had been no means or time to

put in proper condition for preservation. Steam-heated apparatus has been installed upon the roof of the Museum building, and the assistant curator, Miss McLellan, has been devoting her energies during the last part of the year to the preparation of these specimens and with most satisfactory results.

There has been also on hand a number of unprepared hides of large mammals. These have been carefully tanned by Frank Tose, of the Department of Exhibits, and are now stored in their proper place.

The present curator and assistant curator have had their time so occupied as to be unable to finish the identifying and proper labelling of all the specimens in the mammalogical collection, but this work is carried on as time permits and is well under way.

Accessions to the collection have been as follows: *By exploration*, 171 specimens. *By gift*: John Cebrian, 1; H. Walton Clark and William J. Martin, 28; California State Department of Agriculture, 1; Mrs. Kleupfer, 1; Miss Sarah Lindsay, 1; Dr. Homer Righetti, 1; Francis A. Smith, 11; W. M. Phillips, 3; Steinhart Aquarium, 2; U. S. Bureau of Fisheries, 3. *By purchase*, 48 specimens. Specimens in the collection now number 4426.

JOSEPH MAILLIARD, *Curator*.

DEPARTMENT OF ORNITHOLOGY

Excellent progress can be reported from this department for the year 1923. All of the cataloging and card-indexing has been brought up-to-date by the assistant curator, Miss M. E. McLellan, who has also completed the mounting and arranging of the egg collection.

Field work has received as much attention as the funds allotted to the department would allow, and included a week's trip in early April to Potholes, Imperial County, California, by the curator, accompanied by Mr. Frank Tose as assistant and Dr. Barton Warren Evermann and Mr. E. P. Van Duzee; continuous field work from April 26 to June 25, with R. J. Woods as a student assistant, and with car and camp equipment, in Shasta, Lassen, and Modoc counties; work conducted at points in Butte and Lassen counties, from August 27 to September 30; and a few days at the end of the year at Inverness, Marin County, California, as the guest of Mr. and Mrs. Hugh B. Logan. Observations were carried on and specimens were secured at all the places visited.

The collections of the department have been made use of by students of ornithology, and school teachers take advantage of the loan collection of birds for use in their classes.

Accessions to the collections have been as follows: Bird skins:—*By exploration*, 464 specimens. *By gift*: Wallace Adams, 111; California Fish and Game Commission, 1; John Cebrian, 1; I. B. Connett, 1; E. C. Counter, Jr., 1; Dr. E. Goodman, 1; Joseph Mailliard, 3; Ignatius McGuire, 1; John McLaren, 2; W. M. Phillips, 3; E. G. Schmiedell, 1; M. J. Smith, 1; Earl B. Snyder, 1; C. A. Westenberg, 1. The total number of specimens on hand at the end of the year 1923 is 39,931, an increase of 593 over last year's total.

Nests and birds' eggs have been received, as follows: *By exploration*, 7 specimens. *By gift*: A. P. Christoffersen, 36; H. J. Grauerhalz, 1; Mrs. Lucy M. Zoberbier, 1.

JOSEPH MAILLIARD, *Curator*.

STEINHART AQUARIUM

The Steinhart Aquarium opened its doors to the public September 29, 1923.

The 85 exhibition tanks have all been stocked, maintained, and kept reasonably clean. The several thousands of animals have been regularly fed and cared for, and the building has been kept open to the public every day,—including Sundays and all holidays, from 10 a. m. until 5 p. m.

On January 1, 1924, there were on exhibition a total of 8,046 animals representing 177 species. These are divided among the animal kingdom as follows: 7891 fishes, 75 turtles, 35 snakes, 4 alligators, 12 frogs, 5 fur seals, 2 Steller sea lions, 2 California sea lions, 1 leopard seal, 1 canvas-back duck. Not included in the above total are a number of invertebrates, among them being 200 crabs, starfish, sea urchins, hermit crabs, etc. The mortality list numbers 334 fishes, which is not excessive. Most of these dead specimens have been preserved and form the nucleus of a study collection.

The 16 tanks of tropical fishes from the Hawaiian Islands constitute one of the most popular exhibits in the Aquarium. There are now 226 of these fishes representing 51 species. This number will soon be increased. One of the most satisfactory exhibits is the five tanks of Golden Trout from the Kern River region. All of the known species of Golden Trout are shown, also the Kern River trout, *Salmo gilberti*. Of the 141 golden trout placed in the exhibition tanks July 31, only three small ones have died.

In the normal salt-water tanks the brilliantly-colored Garibaldi (*Hypsypops rubicundus*) form a very attractive exhibit. They share the popular attention, however, with the large California pipefish, leopard sharks, embryo skates and electric rays. There are 407 specimens of fish in the 16 tanks of normal salt-water, representing 45 different species.

The exhibits have been acquired in three different ways:—(1) collected by members of the Aquarium staff; (2) purchased outright; (3) received as gifts. The greater number have been acquired in the first manner. The Steller Sea Lions, California Sea Lions, Leopard Seals, and a few turtles, snakes and frogs have been purchased. The fur seals were obtained through the courtesy of the United States Bureau of Fisheries. Gifts are numerous. Among those who have donated specimens of special value may be mentioned the following:

California Fish and Game Commission through Mr. W. H. Shebley, a large number of trout and other fishes; the Nevada State Fish and Game Commission, 110 albino eastern brook trout; and the New York Aquarium, nine horse-shoe crabs. There were many other donations.

The number of invertebrates in the tanks is still comparatively small, consisting of about 220 crabs of several species, a few chitons, sea urchins and starfish, and at present, one octopus. It is hoped to increase the number and add more delicate forms as the tanks become thoroughly leached out and ripened. The invertebrates are apparently more susceptible to lime and mineral salts from the cement and pipes than vertebrates are and it will be some months before these delicate forms can be kept in the tanks without considerable loss.

In addition to the large indoor exhibition tanks there are 20 balanced aquariums, and provision has been made to increase this number to 40. The 10 large balanced aquariums around the planted area were all arranged

planted, and their contents donated to the Steinhart Aquarium, by the amateur aquarists of San Francisco, a prize having been offered for the most attractive aquarium and a second prize for the best assemblage of fishes in a single tank.

The central feature in the building is the swamp. This has proved to be an object of unusual interest to visitors. At the present time, in addition to a considerable number of plants and vines, it contains 35 snakes, 4 alligators, 75 turtles, frogs and toads, and 300 fishes of which about 150 are the mosquito fish (*Gambusia affinis*).

Through the courtesy of the California State Fish and Game Commission we have been enabled to keep a supply of young fish in the hatchery. On January 8 a number of dog salmon eggs were placed in the hatchery and were objects of great interest to the visitors. Owing, however, to the eggs being immature when taken, they did not hatch. It is intended soon to add some jars to the equipment and to hatch out not only salmon and trout but shad and other anadromous fishes.

On October 9, through the courtesy of the U. S. Bureau of Fisheries, four two-year old male fur seals were received at the Aquarium from the Pribilof Islands. They were at once placed in the big central pool and some live carp were given to them. The seals immediately captured the carp and began to feed. Since that time we have had very little difficulty in the matter of feeding. On November 29 four two-year-old female fur seals were received from the same source. One refused to eat and died within a few days. Two of the first lot also sickened and died. A careful autopsy showed that death was due to perforation of the alimentary canal caused by a small round worm. The remaining five were treated with a vermifuge with apparently good success, as they are now in good condition, feed freely, and show no evidence of internal parasites. It is interesting to note that they consistently refuse fresh salmon for food. They prefer herring, anchovies or sardines to any other kinds of fish, and will usually refuse a fish if it has been beheaded or sliced. They take octopus and squid freely.

In the east one of the out-door pools we have had since the opening of the Aquarium a fine yearling Leopard or Harbor Seal, captured in San Francisco Bay by some fishermen. For some months it was kept at the Paladini Wholesale Fish Market on Clay Street. The doors of this market were wide open and there was nothing to prevent the seal from returning to the bay, but it made no effort to escape, evidently preferring the atmosphere of the fish market.

On September 12, 1923, two fine California Sea Lions, one of each sex, were purchased from Mr. Will Winston, of Pacific Grove. They are believed to be about one year or eighteen months old, were secured at Santa Barbara, California, and arrived in good condition. They keep in excellent health, and form a lively and interesting addition to the exhibits.

On December 13, 1923, two fine yearling male and female Steller Sea Lions were purchased from Mr. G. M. McGuire of Santa Barbara. They arrived in good condition and were at once placed in the pool with the California Sea Lions. They are of much heavier build and much less active than the California Sea Lions. They feed freely on all kinds of fish and have remained in good condition.

The Library at present contains 610 bound books and perhaps a thousand pamphlets, almost all being a loan from the Academy library. Practically all of these publications relate to Marine Biology.

The Laboratory, although not yet equipped, is being utilized to some extent and forms the meeting place of the thriving San Francisco Aquarium Society of 75 members which meets regularly on the first Thursday evening of each month.

As at present constituted, the personnel of the Aquarium, exclusive of the four members of Academy staff on part time, numbers fifteen people, viz.:—one superintendent; one assistant superintendent; one aquarist; one collector; one carpenter; three feeders and attendants; three engineers; two janitors; one door attendant; and one relief man. This seems a large number, but it is as few as the institution can be operated with efficiently. The machinery and pumps at the Aquarium have to run all the time, night and day, making it necessary to have three shifts of engineers. In order that each one may have one day off in seven a relief man is necessary. It is a pleasure to commend the work of the Aquarium employees and to note the cheerfulness and efficiency with which their work has been performed.

ALVIN SEALE, *Superintendent.*

ACCESSIONS TO MUSEUM AND LIBRARY

- Adams, Wallace, Steinhart Aquarium: Assortment of artificial eyes and 7 lb. arsenical soap and 1 lb. arsenic; The Osprey, Vol. 5, No. 3, January and February, 1901; 111 bird skins from Mexico; 5 separates from the United States Geological Survey Professional Papers. Gift.
- American Museum of Natural History, New York City: Three lizards from West Indies. Exchange.
- Anderson, Mrs. Eric, Shasta Springs: Two California plants. Gift.
- Anderson, Frank, Berkeley: California State Mining Bureau, Bulletin No. 10, first edition. Large collection of Tertiary and Cretaceous fossils from Colombia, South America; collection of living shells from Panama Bay; four specimens of foraminiferal shale from Southern California. Gift.
- Anderson, Mrs. S. A., 2604 Etna Street, Berkeley, California: 21 insects from Colombia. Gift.
- Arboretum, Arnold, Jamaica Plain, Mass.: Three hundred and ten specimens of North American plants; Zabel collection, 41 specimens, European and exotic. Exchange.
- Arundell, Frank, Fillmore, Calif.: Two lizards, *Phrynosoma hernandesi*, female, and *Phrynosoma platyrhinos*, from Arizona. Gift.
- Australian Museum, Sydney, N. S. W.: One hundred and one specimens of reptiles and amphibians from Australia. Exchange.
- Baker, Dr. Fred, Point Loma: Four species of marine mollusks from Hawaii; 20 land and freshwater shells from Java, China, and Costa Rica. Gift. Three specimens, *Succinea lauta* Gld., from Japan. Exchange.
- Barbour, Dr. Thomas, Cambridge, Mass.: Three lizards from China. Exchange.
- Bassett, F. W., Jonesville: Twenty-four California plants. Gift.

- Behrens, Miss Bertha T., 958 Haight Street, San Francisco: One California plant. Gift.
- Berry, Dr. S. S., Redlands: Sixty-six land and freshwater shells from western North America (10 species, including paratypes of three species). Gift.
- Bethel, Ellsworth, State Building, Denver, Colorado: 283 California plants, 70 specimens mounted; 33 specimens unmounted. Gift.
Thirty-seven California plants. Exchange.
- Billings, F. H., Redlands, California: 26 specimens of California plants. Gift.
- Blair, Duke, Skagg: Seven specimens of Realgar. Gift.
- Blaisdell, Dr. Frank E., 1520 Lake Street, San Francisco: 362 insects, mostly from Mt. Hermon, California; U. S. D. A. Farmer's Bulletins Nos. 1286 and 1249; U. S. D. A. Year Book 1922; 120 pamphlets. Gift.
- Blazic, Antone, 630 Parkman Avenue, Los Angeles: One plant from Massachusetts; 93 specimens southern California exotics. Gift.
- Bliss, Mrs., Tahoe City: Three California plants. Gift.
- Bowman, C. W., San Francisco: One Alaska parka. Gift.
- Boyd, Miss Louise, San Rafael: One botanical specimen from King's Mountain. Gift.
- British Museum, London, England: Two frogs from Philippine Islands. Exchange.
- Bush, R. E., Georgetown: One California plant. Gift.
- Calif. Academy of Sciences Expedition to Galapagos Islands (1905-1906): Two hundred and forty-five land shells (sixty-three lots) including types of fourteen described species and five undescribed subspecies. Exploration.
- Gulf of California Expedition, 1921: Collection of marine mollusks numbering approximately 100,000 specimens. Collection of fossil shells numbering about 1,000 specimens. Exploration.
- California Department of Agriculture, San Francisco: One *Paradoxurus* sp. in flesh, from Cebu, Philippine Islands. Gift.
- California Fish and Game Commission, San Francisco, California: One *Fulica americana* (albino), in flesh, from Santa Cruz County, California. Gift.
- Cebrian, John C., 1801 Octavia Street, San Francisco: One *Scapanus* sp. (no data); one fan of Egret feathers; one Gorgonian Coral. Gift.
- Christoffersen, A., San Francisco: 36 bird eggs from Sea Lion Rock, Pribilof Islands; 24 botanical specimens and photographs from St. Paul Island, Alaska; 125 insects from St. Paul Island, Alaska. Gift.
- Clark, H. Walton, California Academy of Sciences: Four freshwater Pelecypoda; one *Microtus* in flesh; 27 skulls from San Mateo County. Gift.
- Comstock, Dr. John A., Southwest Museum, Los Angeles, California: One rare moth (*Hemileuca brusi*) from California. Gift.
- Cornett, I. B., Los Baños: One mounted specimen of *Philacte canagica*, from Los Baños. Gift.

- Cornwall, Ira. E., Quarantine Station, Williams Head, Victoria, B. C.: Seven Barnacles from British Columbia; one Barnacle from Humpback Whale. Gift.
- Cramsie, Mrs. J. E., Smartsville, California: 12 California plants. Gift.
- Daring, W. L., U. S. Forest Service: One California plant. Gift.
- De Graw, Mrs., Auberry: One plant from Fresno County. Gift.
- d'Eilbert, W. D., Willows: One plant from Butte County. Gift.
- Dodds, Clifford, Ventura, California: 1241 insects from Los Mochas, Mexico. Gift.
- Dodds, C. T., University of California, Berkeley: One thousand insects from Sinaloa, Mexico. Exchange.
- Dolter, Carl, Monterey, California: One specimen *Haliotis kamschatkana*, Monterey, California. Gift.
- Donahoe, Mrs. Joseph, Menlo Park: Two botanical specimens from Menlo Park. Gift.
- Eastwood, Miss Alice, California Academy of Sciences, San Francisco: U. S. Department of Agriculture Year-book, 1913 to 1918 (six books); three land snails from northern California; 12 California plants. Gift. 100 Ostracods from Yosemite; 400 specimens of plants from Del Norte County; 121 specimens of plants from Siskiyou and Shasta Counties; 41 specimens of plants from Humboldt County; 45 specimens of plants from Mt. St. Helena; 53 specimens of plants from Yosemite; 96 specimens of plants from Ensenada, Mexico; 44 specimens exotics from Santa Barbara; 56 specimens from Pt. Reyes; 14 specimens from Los Angeles; 24 specimens from Mt. Hamilton and Mt. Diablo; 36 specimens from Shasta Springs; 16 specimens from Yreka and vicinity. Exploration.
- Erwin, Richard P., Boise, Idaho: Three small rattlesnakes from X-ray Gulch, five miles east of Boise, Idaho; one large rattlesnake from Indian Creek, about 20 miles south of Boise, Idaho; one gopher-snake taken at Kuna Cave, five miles south of Kuna, Idaho; five rattlesnakes from Snake River at Swan Falls, Ada Co., Idaho. Gift.
- Evermann, Dr. Barton Warren, California Academy of Sciences: Six books; one botanical specimen from Amaknak Island, Alaska. Gift. Three sets (6 eggs) *Auriparus flaviceps flaviceps*, from Imperial County. Exploration.
- Fenn, Mrs. R. W. Lindsay: One botanical specimen from Lindsay, Tulare County. Gift.
- Fields, W. S., Ferry Building, San Francisco: One botanical specimen from Japan. Gift.
- Fleming, George, San Diego: Six native plants from San Diego. Gift.
- Fouke Fur Co., St. Louis, Mo.: Three fur-seal skins, one of them showing natural condition of skin before removal of hair, after dressing, and after dyeing. Gift.
- Fox, C. L., San Francisco: Two land snails from Sequoia National Forest. Gift.

- Fox, C. L., 1621 Vallejo Street, San Francisco: 619 insects, mostly from California. Gift.
- Gaylord, E. G., Hanna, Dr. G. D. Menke, J. G., Pacific Oil Company, San Francisco: Lot of Maricopa shale. Gift.
- Goodman, Dr. E., San Francisco: One *Phalaropus fulicarius*, in flesh, from San Mateo County, California. Gift.
- Goodrich, Calvin, Toledo, Ohio: Forty-one specimens, representing six species of freshwater Gastropoda. Exchange.
- Goudkoff, Paul P., Bakersfield: Two specimens *Cardium meekianum*. Gift.
- Grant, Miss Adele L., Cornell University, Ithaca, New York: 14 California plants. Gift.
- Grauerholz, H. J. San Francisco: Nest of *Cinclus mexicanus unicolor*, from Humboldt County. Gift.
- Grevecoeur, Onaga, Kansas: 1541 beetles from Kansas, 900 purchased, 641 presented. Gift and Purchase.
- Griffin, Miss Alice, Glen Ellen: One botanical specimen from Sonoma County. Gift.
- Haley, Mr. and Mrs. George, San Francisco: One botanical specimen from St. Paul Island. Gift.
- Hall, Prof. H. M., Berkeley: Fourteen frogs from California. Gift.
- Hallawell, Harry E., Market Street, San Francisco: One cultivated plant, for determination. Gift.
- Hanna, Dr. G. Dallas, California Academy of Sciences, San Francisco: United States National Museum, Bulletin 62; University of Michigan, University Bulletin, New Series, Volume 15, No. 15; University of Michigan, Occasional papers of the Museum of Zoology, No. 137; 18 pamphlets. Gift.
- Hanna, Marcus A., Department of Geology, University of Washington, Seattle, Washington: A large collection of mollusks from Pyramid Lake, Nevada, consisting of several thousand specimens of two species which are apparently confined to that body of water; fifteen freshwater snails from six miles east of Ensenada, Lower California. Gift.
- Hanscome, Russel, 848 Clayton Street, San Francisco: One plant from Marin County. Gift.
- Hart, Cecil, Los Angeles: Thirteen weeds from Los Angeles and 40 other plants from southern California. Gift.
- Hazard, William, Hallawell Seed Company, San Francisco: One cultivated plant. Gift.
- Hercules Powder Co., San Francisco: One tooth of fossil mammoth found in San Diego County, California. Gift.
- Hitchcock, J. L., San Francisco: One rattlesnake from Lake County. Gift.
- Holladay, Edmund Burke, Pasadena: Four volumes, including old numbers of the Academy's publications, and two photographs. Gift.
- Hunt, Miss Clara A., St. Helena: Seven plants from St. Helena. Gift.
- Jackson, Miss Belle R., San Rafael: Four California plants. Gift.
- Jeffers, Le Roy, New York: Four books. Gift.

- Jones, Mr. Frank P., Wilmington, Delaware: 44 insects, mostly from Texas and Arizona. Gift.
- Jones, Miss Katherine D., Berkeley: One botanical specimen, exotic, cultivated in California. Gift.
- Johnston, Don P., Okeechobee, Florida: One rattlesnake from Florida. Gift.
- Johnston, E. C., Lawrence, Kansas: Fourteen botanical specimens from Akutan, Alaska. Gift.
- Jordan, Dr. David Starr, Stanford University: One slab fossil fish, and one sample diatomaceous earth from Lompoc. Gift.
- Kelley, Mrs. G. Earle, Alameda: One botanical specimen from Porterville and 14 other California plants. Gift.
- Kennedy, C. H., Ohio State University: 228 dragon-flies, mostly from California. Gift.
- Keys, Miss Jennie G., Sacramento: One California plant. Gift.
- King, Miss M. Alice, Placerville: Fifty California plants. Gift.
- Kingsley, E. S., San Francisco: One Indian mortar and two pestles. Gift.
- Kinsey, Dr. A. C., University of Indiana, Bloomington, Indiana: 114 gall-flies and their galls. Gift.
- Klauber, L. M., San Diego: 23 salamanders from New York State, and 108 salamanders from San Diego County. Gift.
- Klein, Miss Marie G., San Francisco: One California plant. Gift.
- Klepfer, Mrs., San Francisco: One *Callithrix leucopus*, in flesh, from Panama. Gift.
- Kneiss, Karl E., San Francisco: Five echinoid tests, and 156 molluscan shells. Gift.
- Knobel, Miss Louise, Hope, Arkansas: 182 insects, from Arkansas. Purchase.
- Kusche, J. A. Montebello: 1322 insects from Solomon Islands. Purchase.
- Leach, E. R., Piedmont: 149 insects from California. Gift.
- Lindsay, Miss Sarah, 159 Ninth Avenue, San Francisco: One *Callithrix leucopus* in flesh. Gift.
- Little, Luther, South Pasadena: Five land shells from Riverside County. Gift.
- Losing, H. P., Mobile, Alabama. One snake from Alabama. Gift.
- Mailliard, Joseph, California Academy of Sciences, San Francisco: A large and valuable collection of freshwater shells from Eagle Lake, 150 specimens of land and freshwater shells from northern California, and one song sparrow from Marin County. Gift.
- Accessory materials for Oregon Ground Squirrel and Lewis Woodpecker groups; one red-breasted sapsucker nest from Modoc County; 152 bird skins from Butte, Lassen, Modoc, and Tehama counties; 200 freshwater mollusks from Lassen County; 68 mammal skins and skulls from Butte, Lassen, and Modoc counties; one *Thryomanes bewicki spilurus*, in flesh, from San Francisco; 75 bird skins and 32 mammal skins from Imperial County; 176 bird skins and 36 mammal skins, and 28 mammal skins and skulls from Modoc County; three sets of eggs and two nests from Modoc

- County; one nest of White-headed Woodpecker from Lassen County; 47 bird skins from Modoc and Lassen counties; two nests of Marsh Wren from Lassen County; 16 mammal skins from Modoc and Lassen counties; one set eggs from Modoc County. Exploration.
- Marshall, Byron C., Imboden, Arkansas: 148 beetles, from Arkansas. Gift.
- Martin, Bruce: 93 insects from Colombia, South America. Gift.
- Martin, J. O., California Academy of Sciences, San Francisco: 719 insects, mostly from California, including types of seven of his new species of beetles; 14 freshwater shells from Mt. Diablo. Gift.
- Martin, Wm. J., Steinhart Aquarium, San Francisco: Six specimens of fossil shells from 12 miles west of Petaluma. Gift.
- Mason, H. L., Stanford University: One toad from California. Gift.
- McGuire, Ignatius, San Francisco: One *Thryomanes bewicki spilurus*, in flesh, from San Francisco. Gift.
- McKelvey, Mrs. Charles W., Arnold Arboretum, Jamaica Plain, Mass.: 189 botanical specimens from Rocky Mountains and New England. Gift.
- McKenzie, Mrs. E. R., San Luis Obispo: Four California plants. Gift.
- McLaren, John, Golden Gate Park, San Francisco: One specimen of *Buteo borealis calurus* in flesh; one *Macropus rufus* in flesh, from Golden Gate Park; specimens of three Australian plants; one specimen of *Mustela zanthogenys munda* in flesh, from Golden Gate Park; one skunk in flesh, from Golden Gate Park; one *Ardea herodias hyperonca*, in flesh, from Golden Gate Park; one specimen of *Odocoileus virginianus macrourus* fawn, from Golden Gate Park; and one *Chenopsis atrata* in flesh, from San Francisco. Gift.
- McLellan, Miss Mary E., San Francisco: Fourteen specimens Fluminicola from Jonesville, Butte County. Exploration.
- Meiere, Mrs. Ernest, Los Altos, California: One plant for determination. Gift.
- Menzies, Robert, San Rafael: Four cultivated plants from Marin County. Gift.
- Merriam, Dr. C. Hart, Lagunitas, California: Four specimens of California plants. Gift.
- Michael, Mrs. Enid, Yosemite, California: 13 botanical specimens from Yosemite. Gift.
- Miller, Robert C., Department of Zoology, University of California: One vial alcoholic specimens of *Teredo nivalis*. Gift.
- Mitchell, Mrs. H. M., San Francisco: Twenty California plants. Gift.
- Munz, Philip A., Pomona College, Claremont: 14 specimens of California wild flowers. Exchange.
- Museum of Natural History, Leiden, Holland: Four salamanders from Japan. Exchange.
- Nijgh & Van Ditmar, Rotterdam, Holland: One book, Modern Holland. Gift.
- Norton, A., Pacific Grove: One botanical specimen from Monterey. Gift.

- Ogle, Alva E., Orubaun: One *Bassariscus astutus raptor*, female, in flesh. Purchase.
- Orpet, E. O., Park Superintendent, Santa Barbara: Two California plants. Gift.
- Pack, Herbert J., Logan, Utah: One toad from Utah. Exchange.
- Peters, Herman, San Rafael: 360 insects from Australia. Gift.
- Peers, Miss Susie M., San Francisco: Current issues of Science. Gift.
- Peterson, A., San Francisco: Indian pestle from near Austin Creek, Duncan Mills, Sonoma County. Gift.
- Phillips, Warren, Golden Gate Park Warden: One *Accipiter cooperi* and one *Accipiter velox*, in flesh. Gift.
- Ping, Professor, C., Nanking, China: 11 snakes from China. Exchange.
- Pomona College, Pomona: 122 botanical specimens from Nicaragua, collected by C. F. Baker, and 106 from southern California, collected by P. A. Munz and Ivan Johnston. Exchange.
- Pope, Dr. Saxton, San Francisco: One book, "Hunting with the Bow and Arrow," by Saxton Pope. Gift.
- Purdy, Carl, Ukiah: Two California plants. Gift.
- Putnam, P. G., Pullman, Washington: 34 salamanders, 41 frogs, 3 lizards, 1 snake, 42 toads, and 3 turtles. Purchase.
- Raphael, Miss T. V., Worth Hotel, San Francisco: Five California plants. Gift.
- Raven, Miss Gertrude, Tomales: Three California plants. Gift.
- Reagan, Albert B., Cornfields, Arizona: One land shell from Cornfields, Arizona, and nine land shells from the Mogollon Mountains, Arizona. Gift.
- Redfern, C. M., 52 Shoreview Avenue, San Francisco: Two exotic plants for identification. Gift.
- Reed, C. A., Santa Cruz: One California plant. Gift.
- Renner, Otto, Paso Robles: Six California plants. Gift.
- Rhodes, Captain H. W., Berkeley: Nine books. Gift.
- Richards, Mrs. J. E., San Jose: botanical specimen. Gift.
- Ricksecker, Mrs. H. E., 1683 Eighth Avenue, San Francisco: 183 insects from Oakland and Cisco. Gift.
- Righetti, Dr. Homer, 818 Shreve Building, 210 Post Street, San Francisco: One *Ursus* sp., skull, from Alaska. Gift.
- Rixford, Dr. Emmet, 1795 California Street, San Francisco: Two specimens of California plants and three fossil shells from Wildhorse Cañon, Monterey County, collected by Jack Copley for Mrs. Edward Dowd of Monterey. Gift.
- Rixford, G. P., San Francisco: Five specimens of exotic plants cultivated in California. Gift.
- Robertson, G. D., Los Angeles: One specimen *Turritella uvasana* from San Clemente Cañon, San Diego County. Gift.

- Rodda, Mrs. A. F., San Francisco: Forty-one plants from Utah. Gift.
- Rose, Alexander, Rose's Nursery, San Francisco: One exotic plant. Gift.
- Ruddock, George T., Berkeley: One botanical specimen from Montana. Gift.
- Ryan, C. A., Monterey: Six specimens *Ostrea lurida*, from Quaternary deposits, two miles east from Castorville. Gift.
- San Francisco International Fish Co., San Francisco: One leather-back turtle (*Dermochelys schlegelii*), caught off Santa Cruz. Gift.
- Sessions, Miss Kate O., San Diego: One California plant and specimens of a rare acacia from San Diego. Gift.
- Schmiedell, E. G., 203 California Street, San Francisco: One *Circus hudsonicus*, in flesh, from Solano County. Gift.
- Scupham, J. R., Oakland: One adult and one young *Didelphis virginiana*, in flesh, from Alameda County. Gift.
- Shell Company of California, San Francisco: 125 fossils from Peru. Gift.
- Skinner, Kenneth, Brooklands Estate Office, Weybridge, England: 13 sets of bird eggs. Exchange.
- Slevin, J. R., California Academy of Sciences: One botanical specimen from Montana and one California plant. Gift. 40 land shells from Todos Santos Island, Lower California, and 136 insects from Lower California, mostly from San Pedro Martir Mountains. Exploration.
- Slevin, Louis, Carmel: 509 insects from California, mostly from Monterey County. Gift.
- Snyder, Earl B., Ornbau: One Pygmy Owl, in flesh, from Ornbau. Gift.
- Smith, C. Piper, San Jose: Duplicate of type specimen of a *Lupinus*. Gift.
- Smith, Miss Emily S., San Jose: Three California plants. Gift.
- Smith, Francis A. (through Dr. David Starr Jordan), Kin Jo Ri, Koksan, Korea: Six skins and five skulls of wild boar from Korea. Gift.
- Smith, Mrs. M. J., 501 Irving Street, San Francisco: One mounted specimen of *Eulabes religiosa*, from India. Gift.
- Southern Pacific Company, Geological Department, San Francisco: Twelve boxes of fossils and 11 boxes of rock. Gift.
- Stacey, J. W., Golden West Hotel, San Francisco: 11 botanical specimens from California localities. Gift.
- Steinbeck, W. P., Stockton: 38 California plants. Gift.
- Steinhart Aquarium, Golden Gate Park, San Francisco: One *Phoca richardi geronimensis*, juvenile, in flesh: 38 salamanders and one toad from Washington; one skull of *Callorhinus alascanus*, from the Pribilof Islands, from the male that died in the Aquarium Dec. 14, 1923. Gift.
- Stephens, Frank, San Diego: Three snakes from San Diego County. Gift. Two boxes pine bark, material for California Woodpecker Group; three immature desert wood rats, and accessory materials for woodrat group; four *Dipodomys* from San Diego County, in flesh; 34 mammal skins from San Diego County; three skins of Fox Sparrow; two specimens of *Taxidea taxus neglecta*, with skulls, from San Diego County; seven mammal skins and skulls from Riverside and San Bernardino counties. Purchase.

- Stephens, Mrs. Kate, San Diego: Eleven species of fossils from Claiborne Eocene. Gift.
- Stow, Mrs. Vanderlyn, San Francisco: Nest of *Vespa fernalki*. Gift.
- Strecker, John K., Waco, Texas: 548 reptiles and amphibians from southeastern United States and Australia. Exchange.
- Sutcliffe, Mrs. E. C., San Francisco: Nine California plants; one lizard from Marin County, one snake skin from Alameda Creek, and one rattlesnake skin. Gift.
- Swingle, Dr. Walter T., Indio: One botanical specimen from Indio. Gift.
1178 Chinese plants. Exchange.
- Thew, Miss Susan P., Exeter: One California plant. Gift.
- Tieje, Dr. Arthur S., Los Angeles: Five specimens of diatomaceous earth from Sierra Vista, Los Angeles County. Gift.
- Tose, Frank, California Academy of Sciences, San Francisco: Seven birds from San Mateo County; five specimens of *Speotyto cunicularia hypogaea*, from Berkeley, two specimens of *Citellus beecheyi beecheyi*, from Berkeley, three birds from Berkeley, one *Microtus* from San Francisco, one *Sciurus niger rufiventer*, in flesh, from San Francisco, and one example of *Citellus beecheyi beecheyi*, in flesh, from Alameda County. Exploration.
- U. S. Bureau of Fisheries, Washington, D. C.: Two skeletons and one skull of *Callorhinus alascanus* from Pribilof Islands. Gift.
- U. S. National Museum, Washington, D. C.: 850 botanical specimens. Exchange.
- Van Denburgh, Dr. John, California Academy of Sciences, San Francisco: 75 freshwater Gastropods and 50 freshwater Pelecypods from Los Gatos. Gift.
85 nests of common birds, without accompanying sets of eggs and 18 bird skins, common species. Exchange.
- Van Duzee, E. P., California Academy of Sciences, San Francisco: Eight specimens of plants from southern California. Gift.
4630 insects, as follows: 1516 from Yuma, Arizona and Potholes, California; 150 from Mt. Diablo; 41 from Mill Valley; 2467 from Ensenada, Lower California; San Diego County, and Mill Creek Cañon; 135 from Huntington Lake; 321 from Pittsburg, and 200 land shells from Utah, collected in the summer of 1922. Exploration.
- Van Duzee, Mrs. Helen, San Francisco: One book. Gift.
- Walter, Frank, San Diego: One exotic botanical specimen from San Diego. Gift.
- Walther, Eric, Golden Gate Park, San Francisco: 46 insects from the Golden Gate Park; 113 exotic plants from Santa Barbara; 20 exotic plants from Monterey; 320 botanical specimens, exotics, cultivated in California; and 120 cultivated plants from Golden Gate Park. Gift.
- Westenberg, C. A., 1128 Benvenue Avenue, Berkeley (through H. V. Redmond, 3030 Benvenue Avenue, Berkeley): One *Ara macao*, in flesh, from Mexico. Gift.

- Wicks, Miss Ethel, San Francisco: One California plant. Gift.
- Wilke, R. M. Palo Alto: Collection of 300 named species of European fossils. Exchange.
- Woodrum, J. H., 2038 Ellis Street, San Francisco: Image found in a bag of coffee sent from Brazil to Hills Brothers, San Francisco, in 1923. Gum from New Zealand. Jade (New Zealand Store) from New Zealand, used by Aborigines in making war implements. Gift.
- Wright, Mrs. Elizabeth, Calistoga: One California plant. Gift.
- Wright, Miss Elizabeth C., Mono Lake, Calistoga, California: Eight specimens. Gift.
- Wynd, F. Lyle, Eugene, Oregon: Three Oregon plants. Gift.
- Zoberbier, Mrs. Lucy M., San Francisco: One Rhea egg from Argentine Republic. Gift.

FINANCIAL STATEMENTS

REPORT OF THE TREASURER

for the fiscal year ending March 31, 1924

April 1, 1923, Balance due Crocker National Bank.....\$ 2,249.90

Receipts

Dues.....	\$ 3,862.25
Charles Crocker Scientific Fund Endowment Income.....	1,335.13
James Lick Endowment Income.....	53,732.24
General Income.....	17,602.20
John W. Hendrie Endowment Income.....	900.00
U. S. Treasury Certificates.....	2,997.50
Interest.....	563.91
Bills Receivable, Ignatz Steinhart Trust.....	119,000.00
Ignatz Steinhart Trust Interest.....	2,826.24
Ducks of the World Donation.....	160.00
J. D. Grant Donation.....	279.85
Alaska Fur Seal Motion Pictures (Fouke Fur Company).....	290.00
Wild Life Protection Fund.....	350.00
W. G. Wright Fund.....	43.00
Publications.....	404.84
Sundry Refunds.....	268.68
Museum.....	353.78
Sundry Accounts.....	89.33
Post Card Sales.....	1,192.41
	\$206,251.36
	\$204,001.46

REPORT OF THE TREASURER—Continued

Expenditures

Expense.....	\$ 2,668.04	
Salary Expense (general).....	18,022.82	
Bills Payable.....	10,000.00	
Insurance.....	2,023.75	
Interest.....	15,255.53	
Museum Department Appropriations.....	8,481.35	
Museum Department Salaries.....	13,995.00	
Library.....	1,307.12	
Dues Refunded.....	20.00	
Publication.....	2,699.35	
Office Furniture.....	50.00	
Steinhart Aquarium Construction.....	99,890.49	
Steinhart Aquarium Equipment.....	17,773.77	
Steinhart Aquarium Revolving Fund.....	5,000.00	
Antelope Fund.....	8.76	
Alaska Fur Seal Motion Pictures.....	290.00	
Wild Life Protection Fund.....	208.20	
Tools and Equipment.....	294.02	
Loan to Sperry Flour Company.....	5,000.00	
Sundry Accounts.....	502.41	
Sundry Creditors.....	3,838.34	
Contingent Fund.....	570.48	
		\$207,899.43
March 31, 1924, Balance due the Crocker National Bank.....	\$ 3,897.97	

M. HALL McALLISTER, *Treasurer.*

Examined and found correct,
 McLAREN, GOODE & Co., *Certified Public Accountants.*
 San Francisco, Calif., April 26, 1924.

INCOME AND OPERATING EXPENSES

For the Fiscal Year, April 1, 1923 to March 31, 1924

Income:

Charles Crocker Scientific Fund Endowment Income.....	\$ 1,335.13
James Lick Endowment Income.....	53,732.24
General Income.....	17,602.20
Dues.....	3,862.25
Interest from Temporary Investments.....	561.41
Profit on Post Card Sales.....	424.49
	<hr/>
Total Income.....	\$ 77,517.72

Expenditures:

General Expense.....	\$ 1,821.63
Salaries.....	32,444.18
Interest on Mortgage.....	15,255.53
Insurance.....	2,023.75
	<hr/>
Total Expenditures.....	\$ 51,545.09
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Net Income Transferred to Surplus Account.	\$ 25,972.63

SUMMARY OF SURPLUS ACCOUNT

March 31, 1924

Balance, March 31, 1923.....	\$371,683.00
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Additions:

Net Income for Fiscal Year.....	\$ 25,972.63
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Donations:

Ducks of the World.....	200.00
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Accounts Transferred to Surplus by Resolution of Board of Trustees, dated January 28, 1924:	
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W. B. Bourne.....	2,659.31
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Wm. H. Crocker.....	8,342.26
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Herbert Fleishhacker.....	4,000.00
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J. D. Grant.....	2,990.27
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A. K. Macomber.....	3,500.00
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John W. Mailliard.....	1,250.00
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Ogden Mills.....	5,000.00
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Wm. C. Van Antwerp.....	5,120.00
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Total Additions to Surplus.....	\$ 59,034.47
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	\$430,717.47
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Deductions:

Depreciation:

Office Furniture.....	\$ 271.22
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Commercial Building.....	10,336.37
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Museum Building.....	3,840.51
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Storage Cases.....	229.70
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Tools and Equipment.....	391.04
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	\$ 15,068.84
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Surplus, March 31, 1924.....	
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	\$415,648.63
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IGNATZ STEINHART TRUST

March 31, 1924

Amount of Fund:

Bequest from the Ignatz Steinhart Estate...	\$250,000.00
Interest on Temporary Investments.....	54,975.65
	\$304,975.65

Disposition of Fund:

Steinhart Aquarium Construction.....	\$263,315.69	
Steinhart Aquarium Equipment.....	22,092.45	
Temporary Investments:		
Bills Receivable.....	16,000.00	
Revolving Fund.....	5,000.00	
		\$306,408.14
Due Calif. Acad. Sciences, Funds Temporarily Advanced to Steinhart Trust Fund.....	\$ 1,432.49	
		\$304,975.65

BALANCE SHEET

March 31, 1924

*Assets**Property:*

Real Estate, 831-833 Market Street.....	\$600,000.00	
Real Estate, Jessie Street.....	8,083.65	
Commercial Building, 831-833 Market St..	516,818.66	
		<u>\$1,124,902.31</u>
Museum, Golden Gate Park:		
Construction.....	\$192,025.92	
General Collections.....	137,912.17	
Library and Equipment.....	74,412.38	
Tools and Equipment.....	28,556.73	
Office Furniture.....	3,874.64	
		<u>\$ 436,790.84</u>
Investment Securities.....		20,600.00
Ignatz Steinhart Trust:		
Bills Receivable.....	\$ 16,000.00	
Aquarium Construction.....	263,315.69	
Aquarium Equipment.....	22,092.45	
Aquarium Revolving Fund.....	5,000.00	
		<u>\$ 306,408.14</u>
Total Trust Investment and Cash		
Current Assets:		
Office Cash Fund.....	\$ 186.20	
Notes Receivable, Sperry Flour Co....	5,000.00	
Accounts Receivable:		
Ignatz Steinhart Trust Fund.....	1,432.49	
Sundry Accounts.....	168.25	
Post Cards in Stock (for sale).....	1,731.83	
Foreign Exchange.....	36.84	
		<u>\$ 8,555.61</u>
		<u>\$1,897,256.90</u>

BALANCE SHEET—Continued

Liabilities

Endowments:

James Lick Endowment.....	\$804,902.31	
Charles Crocker Endowment.....	20,000.00	
John W. Hendrie Endowment.....	13,600.00	
	<hr/>	\$ 838,502.31

Ignatz Steinhart Trust.....	\$250,000.00	
Ignatz Steinhart Trust Interest.....	54,975.65	
Due California Academy of Sciences, Funds Temporarily used in Construction.....	1,432.49	
	<hr/>	\$ 306,408.14

Alvord Bequest, Botanical.....	5,000.00	
John W. Hendrie Endowment Income.....	2,700.00	
W. G. Wright Fund.....	113.20	
Wild Life Protection Fund.....	141.80	
Ducks of the World Fund.....	100.00	
Bills Payable.....	260,000.00	
Reserve for Depreciation.....	59,837.34	
Sundry Creditors.....	4,907.51	
Crocker National Bank (overdraft).....	3,897.97	
Surplus.....	415,648.63	
	<hr/>	
Total.....		\$1,897,256.90

W. W. SARGEANT,
Secretary, Board of Trustees.

We have examined the foregoing Balance Sheet, together with the books and accounts of the CALIFORNIA ACADEMY OF SCIENCES, and, in our opinion, it is properly drawn up so as to exhibit a true and correct view of the Academy's affairs, as shown by the books.

McLAREN, GOODE & Co.,
Certified Public Accountants.

San Francisco, Calif.,
April 26, 1924.

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