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THE LEDUM GLANDULOSUM COMPLEX

BY C. LEO HITCHCOCK

University of Washington, Seattle

Ledum columbianum was described by Piper (Contr. U. S. Nat. Herb. 11:441,—1906), who cited two collections for the species (the type, *Piper 6451,* from Ilwaco, Pacific Co., Wash., and *Coville 869,* from Clatsop, Ore.) and expressed the opinion that it was "nearest related to *L. groenlandicum,* from which it may at once be distinguished by the absence of the tomentose pubescence. In this respect it resembles *L. glandulosum* alone, but the capsule characters are those of the former species." He described the species as having leaves 4 to 6 cm. long, obtuse but apiculate, strongly revolute, dark green and glabrous above, whitish and resinous-dotted beneath, the midrib and short petiole minutely puberulent; stamens 5 to 7.[1] Besides *L. columbianum,* Piper included two other species of *Ledum* for Washington, *L. glandulosum* Nutt. (characterized by leaves oval or oblong, not revolute-margined, ranging in the Hudsonian Zone from British Columbia to California and Wyoming) and *L. groenlandicum* Oeder (with leaves lanceolate, the margins revolute, rusty-tomentose beneath, in the Humid Transition Zone from Alaska to Greenland, southward to New Jersey, Wisconsin, and Oregon).

Subsequent workers, including Small (N. Am. Fl. 29:38,—1914), Peck (Man. High. Pl. Oreg. 541,—1941), and Abrams (Ill. Fl. Pac. States 3:298,—1951), have recognized Piper's species, and maintained it as distinct from *L. glandulosum* on the basis of its fewer stamens (nearly always "5–6, rarely more"), more elongate capsules, and revolute leaves. They have ascribed to it a more extensive range, including the coastal area as far southward as Santa Cruz County, California, although Jepson (Fl. Calif. 3:19,—1939) included all Californian *Ledum* in *L. glandulosum.*

The writer has had opportunity to examine numerous colonies of non-tomentose *Ledum* in the Rocky and Cascade mountains and along the coasts of Oregon and California, and has been greatly puzzled about the status of *L. columbianum.* In

[1] The isotype of *L. columbianum* at the University of Washington has 10 stamens in each flower.

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brief summary, this is the situation, as he sees it. *Ledum glandulosum,* described from Rocky Mountain material, is a plant that has globose to ovoid capsules averaging about 4 mm. long; leaf-blades mostly less than 3 cm. long and at least half as broad, usually rounded at base, with margins not revolute; and 10 stamens in each flower. It ranges through the Rocky Mountains from Wyoming to Alberta, westward to British Columbia, and southward to central Washington. In Oregon it is found only in the Blue and Wallowa mountains, but it is common in the Sierra Nevada from Fresno to Plumas and Tehama counties and in the Salmon-Trinity Mountains of California. This southern element (which has been called *L. californicum* Kellogg) differs but slightly from the Rocky Mountain material, having a somewhat longer leaf that is more acute at the base and often somewhat revolute. In the serpentine areas of the mountains of southwestern Oregon and adjacent California there is a *Ledum* which resembles the Sierran form of *L. glandulosum* very closely, but it has a more yellowish, oblong-elliptic leaf that is usually slightly revolute; the flowers have 10 stamens. This *Ledum* extends westward toward the coast where it merges with the more revolute-leaved plant usually called *L. columbianum. "Ledum columbianum"* of the coast shows clinal variation in two significant features. The more southern plants have less tightly revolute leaves (in outline usually over 1 cm. broad) and capsules that average between 4 and 4.5 mm. in length. In progression northward the leaves become more strongly revolute and, therefore, somewhat narrower in outline and the capsules lengthen to an average of slightly more than 4.5 (4 to 5.5) mm. long. All coastal plants examined from south of the Columbia River consistently had about 10 stamens in each flower with but slight variation (8 to 12). Unfortunately, no *Ledum* was found in the vicinity of Clatsop, Oregon, whence came Coville's collection mentioned by Piper.

It is not at all difficult to select herbarium material[2] that shows the complete transition from the Rocky Mountain *"glandulosum"* to the coastal *"columbianum,"* with the exception, of course, that the latter will not "key" to *L. columbianum* because of the 10 stamens.

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[2] In the course of this study, herbarium material from the following institutions was borrowed, through the courtesy of the respective curators, to whom I take pleasure in expressing my gratitude: University of California (C) and California Vegetative Type Survey (CVT), California Academy of Sciences (CA), University of Oregon (O), Oregon State College (OSC), and Washington State College (WSC).

In mid-June, 1954, small populations of *"columbianum"* were examined in the vicinity of Ilwaco, from the margins of a cranberry bog *(Hitchcock 20198)* and from cut-over land *(Hitchcock 20197)*. In the first instance, no plants were found with fewer than 8 stamens to a flower, but the second sampling included plants with stamens ranging from 5 to 11, the commonest numbers being 8, 9, or 10. It was not until later, when the herbarium samples were examined under a microscope, that it was noted that each collection included a single specimen with a thin rusty tomentum on the lower surface of the leaves, similar to, but much less abundant than, that characteristic of *L. groenlandicum*. A second sampling of the Ilwacan plants was therefore made, this time in early August. Again two colonies were studied, one of which occurred on fairly recently cut-over land near a cranberry bog 1.2 mile east of Seaview *(Hitchcock 20352)*. Fifty plants were examined, the sampling necessarily being selective, since it was desired to take specimens that would allow at least 5 counts of stamens for each branch, and many of the plants had finished flowering. Of the 50 plants selected, thirty-five had 10 stamens only, ten others showed variation between 8 and 10, and five had 8 or fewer stamens, two having 7 and 8, one having 6, 7, and 8, one having 5 and 6, and 1 having 5 only. None of the shrubs showed any tomentum on the leaves. However, when other plants in fruit were examined, it was noticed not only that a few individuals of *L. groenlandicum* were present *(Hitchcock 20355)* but careful search disclosed a number of plants that had tomentose leaves, ranging from some that were nearly as tomentose as *L. groenlandicum* to others that had only a trace of tomentum. Although most of these plants *(Hitchcock 20357)* were also past flowering, it was possible to obtain counts of stamens on 10 of them, the numbers varying as follows: 5, 6, 7, 8 (1 plant); 6, 6, 6, 8 (1 plant); 6, 7, 8 (1 plant); 6. 8 (1 plant); 8 (2 plants); 8, 9 (2 plants); and 9 or 10 (2 plants). The other colony studied was in an area less recently cleared *(Hitchcock 20360)*. Thirty plants were sampled: one had 10 and 12 stamens; eighteen had 10; six had 9 or 10; two had 8 or 9; one had 8; one had 6 or 7; and one had 5. Six of the thirty plants had a slight trace of reddish wool on the lower surface of the leaves, detectable only with a lens. All plants examined were fertile, as judged by the dried capsules of previous years and plump young developing fruits.

The conclusion seems inescapable that in this particular area, which is one disturbed by logging and agricultural operations and one of the few places where *L. groenlandicum* overlaps *"columbianum"* in range, hybridization has occurred and may still be occurring, although it would seem more likely that most of the intermediate plants are backcrosses with *L. columbianum.*

It is rather obvious that the two plants are at least moderately interfertile, and therefore there is some question whether or not they should be maintained as separate specific entities. When viewed from the standpoint of geographic range and morphological differences (tomentose leaves and 5–7 stamens as compared with non-tomentose leaves and 8 to 10 stamens) it seems not inconsistent to continue to maintain *"columbianum"* and *L. groenlandicum* under separate specific entities.

On the other hand, since there is complete transition between *"columbianum"* and *L. glandulosum,* the following alternative treatments are possible for them: (1) recognize at least one (the plants from southwestern Oregon) and possibly two or even three more taxa at the specific level in addition to *L. columbianum* and *L. glandulosum;* (2) maintain the latter two at the specific level and propose three other taxa of subspecific status; (3) recognize but one species, *L. glandulosum,* with several geographic races. The latter course, it would seem, would most nearly express the relationship of the several taxa, and, therefore, the following taxonomic revision is proposed.

LEDUM GLANDULOSUM Nutt., Trans. Am. Phil. Soc. II, 8:270 (1843).

Plants evergreen shrubs 0.5–3 m. tall, twigs puberulent and glandular-dotted; leaves leathery, deep green, somewhat rugose and usually puberulent to lanate above along midrib, yellowish-green to grayish and finely mealy-pubescent and densely glandular (very rarely brownish-tomentose) on lower surfaces, ovate and rounded at base to oblong-ovate or narrowly elliptic, plane to very conspicuously revolute-margined; flowers white; pedicels 1–2 cm. long; sepals ciliolate and also usually long tortuous-ciliate, glandular; petals 4–6 mm. long, more or less pubescent at base; stamens 10, rarely 12, occasionally 8 or 9, very rarely fewer, filaments densely hairy on lower half, very rarely glabrous; capsule from nearly globose to cylindric-ovoid, puberulent and usually glandular.

KEY TO SUBSPECIFIC TAXA

Capsules globose to ovoid, averaging less than 4 mm. in length; leaf-blades often less than 3 cm. long, margins inconspicuously or not at all revolute.

Leaf-blades usually rounded at base, mostly less than 3 cm. long and at least half as broad as long, margins not at all revolute .....

.....ssp. *glandulosum* var. *glandulosum*

Leaf-blades usually acute at base or over 3 cm. long and less than half as broad, margins often slightly revolute.

Leaves oblong-elliptic, mostly nearly 3 times as long as broad, deep gray beneath, light olive-green above, margins usually slightly revolute .....ssp. *olivaceum*

Leaves various but usually not three times as long as broad, often greenish beneath, dark green above, margins scarcely at all revolute .....ssp. *glandulosum* var. *californicum*

Capsules ovoid to oblong-ovoid, averaging more than 4 mm. in length; leaf-blades usually well over 3 cm. long, margins conspicuously revolute.

Margins of leaves very strongly revolute, the blades apparently less than 1 cm. broad; stamens sometimes fewer than 10.....
.....ssp. *columbianum* var. *columbianum*

Margins of leaves less strongly revolute, the blades usually well over 1 cm. broad; stamens usually 10.

Leaves light olive-green on upper surface, margins but slightly revolute, outline oblong-elliptic, averaging about 3 times as long as broad .....ssp. *olivaceum*

Leaves deep green on upper surface, margins distinctly revolute, outline more narrowly oblong, averaging over 4 times as long as broad .....ssp. *columbianum* var. *australe*

LEDUM GLANDULOSUM ssp. GLANDULOSUM var. GLANDULOSUM.

L. glandulosum Nutt., loc. cit. Type: *Nuttall,* central chain of the Rocky Mts.

Leaves mostly 1–3 (4.5) cm. long and at least half as broad, rounded or distinctly obtuse at base, mostly obtuse at apex, margins not at all revolute; capsules averaging between 3 and 3.5 mm. in length.

Rocky Mountains from northwestern Wyoming to Alberta westward to British Columbia and southward in the Cascades to Kittitas and Yakima counties, Washington, also through central and northern Idaho to the Wallowa and Blue mountains of Oregon.

There apparently is no record of the occurrence of *L. glandulosum* in the Cascade Mountains of Oregon or from the Olympic or Cascade mountains of Washington south of northwestern Yakima and northeastern King counties. It might be expected, therefore, that the plants of the northern Cascades would show much more resemblance to those of the Rocky Mountains, with which they are more or less continuous in range, than to those of the Sierra of California, but in reality they represent a complete transition between the two. Two mass collections, *Hitchcock 20270* from 2 miles north of Fish Lake, Kittitas Co., and *20351* from Mission Peak, Kittitas Co., show the degree of this intergradation.

There is another phase of ssp. *glandulosum* that occurs in the Cascade Mountains that is somewhat distinctive, character-

ized by leaves which are unusually large, even for var. *californicum,* the taxon to which it is being assigned. It is exemplified by the following collections: Kittitas County: Boulder Creek, *Thompson 10691* (W); Scatter Creek Trail, *Hitchcock 7995* (W); King County: 9 miles south of Skykomish, *Broadbent* (CA, W); Okanogan County: Rock Pass, *Fiker 298* (WSC); Tiffany Range, *Fiker 298* (W) and *Thompson 7031* (W). The plants appear to be ecological rather than genetical variants, as they are found usually at rather low elevations and can be matched fairly closely by Californian collections such as Sequoia National Park, Tulare Co., *Mrs. Charles Derby* (CA), and Gold Lake Region, Plumas Co., *Mrs. E. C. Sutliffe* (CA). They have no counterpart in the Rocky Mountains.

Ledum glandulosum ssp. **glandulosum** var. **californicum** (Kellogg) C. L. Hitchc., comb. nov.

L. californicum Kellogg, Proc. Calif. Acad. 2:14 (1863). Type: Sierra Nevada Mts., *Hutchings.* Although this type no longer exists, there can be no reasonable doubt of its identity, since the only *Ledum* that occurs in the Sierra Nevada fits Kellogg's description well.

Leaves often well over 3 cm. long, usually less than half as broad as long, mostly acute at base, margins often slightly revolute; capsules averaging about 3.5 (to 4.2) mm. in length.

Sierra Nevada Mountains of California from Fresno County northward to Plumas and Tehama counties, also in the Salmon-Trinity Alps of Trinity County, California, and in the Cascades of northern Washington.

Occasional Sierran plants, such as the following: above North Lake, Inyo Co., *Ferris 8957* (C), and Sapphire Lake, Fresno Co., *Johnson & Johnson 8212* (OSC), have leaves round at base and are indistinguishable from var. *glandulosum* of the Rocky Mountains. Also, plants with leaves acute at base occasionally are collected in the Rockies, *e.g.,* Holland Lake, Missoula Co., Montana, *Hitchcock 18462* (W, WSC), and head of Pintlar Creek, Beaverhead Co., Montana, *Hitchcock & Muhlick 12825* (W, WSC), and will surely be placed in var. *californicum* by use of the above key. In general, however, it is not difficult to distinguish between plants of the two regions by means of leaf-size and shape.

Ledum glandulosum ssp. **olivaceum** C. L. Hitchc., ssp. nov.

Foliis oblongis aut oblongo-ellipticis, (2) 3–7 cm. longis, supra olivaceis, marginibus paulum revolutis; capsulis ovoideis, circa 4 mm. longis.

Leaves oblong to oblong-elliptic, (2) 3–7 cm. long, upper surface olive-green, margins slightly revolute; capsules ovoid, averaging about 4 mm. in length.

Type: Josephine Co., Oregon, 3 miles west of O'brien, along small marshy springs on soil of serpentine origin, *Hitchcock & Martin 5160* (W).

Other material seen. OREGON. Coos County: Bassendorf Bog, July 10, 1941, *Marshall Ross* (OSC); Iron Mt., *W. H. Baker 4248* (C, CA, OSC). Josephine County: 9.75 miles west of O'brien, July 1, 1950, *Rosenstiel* (OSC); along Whiskey Creek, 8 miles south of O'brien, *Hitchcock 20251* (W) and 10 miles south of O'brien, *Hitchcock 20250* (W); 16 miles below Selma, June 2, 1940, *Overlander* (OSC); Rock Creek, May 27, 1923, *Sweetser* (O); near Waldo, June 5, 1884, *T. Howell* (O). Curry County: Snow Camp Mt. *Thompson 12871* (W); near end of South Fork of road up Pistol River, *Hitchcock 19514* (W).

CALIFORNIA. Del Norte County: trail to Black Butte, *Eastwood 2157* (CA); Shelley Creek, near Monumental, *Parks & Tracy 11357* (C); 5 miles east of Gasquet, *Yates 5764* (C); Gasquet, Aug. 3, 1929, *Heller* (W); Smith River region, *Applegate 5239* (C); Preston Peak, *R. St. John 291* (CVT); between Waldo and Gasquet, *Blasdale 1075* (C); near Oregon Boundary, *Eastwood 12051* (CA); between Crescent City and Oregon line, *Winblad* (CA).

These plants, found only in Del Norte County, California, and adjacent Oregon, appear always to inhabit serpentine soil, usually in company with *Darlingtonia californica*. The nearest Sierran counterparts of ssp. *olivaceum* include: Mt. Lassen National Park, June 10, 1939, *E. D. Cantelow* (CA); Gold Lake, Plumas Co., *Mrs. E. C. Sutliffe* (CA); Salmon Lake, Sierra Co., *Mrs. E. C. Sutliffe* (CA); and east slope of Kaiser Pass, Fresno Co., *H. C. Cantelow* (CA).

Ledum glandulosum ssp. **columbianum** (Piper) C. L. Hitchc., comb. nov.
L. columbianum Piper, Contr. U. S. Nat. Herb. 11:441 (1906).

It is unfortunate that this taxon, as originally proposed, was based upon a type specimen almost surely of hybrid origin, and not entirely representative, because of its few stamens, of this coastal race of *L. glandulosum*. It is not felt, however, that there is ample reason to reject the name.

LEDUM GLANDULOSUM ssp. COLUMBIANUM var. COLUMBIANUM.

Type: *Piper 6451*, Ilwaco, Pacific Co., Wash.

Leaves 3–5 cm. long, margins usually strongly revolute, the blades averaging less than 1 cm. in width of outline, very occasionally more or less rusty-tomentose on lower surfaces; stamens 9 or 10, occasionally fewer, rarely 5; capsules cylindric-ovoid, averaging over 4.5 (4–5.5) mm. in length.

In coastal bogs from Pacific County, Washington, to Clatsop County, Oregon.

Southward in its range ssp. *columbianum* tends to develop broader (less revolute) leaves and somewhat shorter capsules and thus the transition is made to the plants of the California coast which Jepson called *L. glandulosum*. Although, in general, the more southern plants have broader leaves, occasional plants

are to be found in the south that have the more revolute, narrower leaves, *e.g.*, above Gasquet, Del Norte Co., June 1902, *J. B. Davy* (C), and Big Lagoon, Humboldt Co., *Kildale 8774* (OSC). In contrast, a collection made at Ilwaco, August, 1886, *Henderson* (O), has short, broad leaves very similar to those of many collections from the Mendocino County coast mentioned below.

Ledum glandulosum ssp. **columbianum** var. **australe** C. L. Hitchc., var. nov.

Foliis 3–7 cm. longis, marginibus minus revolutis quam in var. *columbiano,* laminis fere 1 cm. latis; staminibus fere 10; capsulis ovoideis, circa 4–4.5 mm. longis.

Leaves 3–7 cm. long, margins less revolute than in var. *columbianum* and blade outline usually at least 1 cm. broad; stamens usually 10; capsules ovoid, averaging between 4 and 4.5 mm. in length.

Type: *A. D. E. Elmer 4944,* Pt. Reyes Post Office, Marin Co., Calif., July, 1903 (C).

Coastal, usually in bogs, from Clatsop County, Oregon, southward to Santa Cruz County, California, extending inland somewhat, as at Pitkin Marsh, Sonoma County, *G. T. Robbins 203* (C); 2 miles southeast of Forestville, Sonoma County, *Yates 5592* (VTM); near Sebastopol, Sonoma County, *Hoover 4112* (C); Noti, Lane County, Oregon, *Eugene Armstrong* (C); and "low ground in old bed of Lake Labish," 3 miles northeast of Chemawa, near Salem, Oregon, *J. C. Nelson 636* (WSC).

On the peculiar sandy soil of the "pine barrens" of Mendocino County, many plants have smaller and more elliptic leaves than the average for the variety. This foliage appears to be produced as the result of general stunting of the plant, since garden introductions *(Hitchcock 20253),* growing at an accelerated rate, are developing larger leaves.

Occasional coastal plants [such as the Yates and Hoover collections above, as well as the following: 1 mile north of Devil's Lake, northern Lincoln Co., Oregon, March 8, 1951, *W. A. Kessi* (OSC), and Yaquina Bay, Lincoln Co., Oregon, July 11, 1881, *L. F. Henderson* (O)] have leaves as slightly revolute as do those from the Sierra Nevada and are practically indistinguishable from such collections of var. *californicum* as the following: Sequoia National Park, July 15, 1932, *Charles Darland* (C); 0.5 mile southwest of Pacific Hills, Alpine Co., *H. Lee 22* (VTM); Butterfly Valley, Plumas Co., *H. M. Hall 9274* (C).

A REVIEW OF CALYPTRIDIUM PARRYI

BY JOHN H. THOMAS

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The known populations of *Calyptridium Parryi* are widely separated geographically and occur from about 2000 to over 10,000 feet. The anther or anthers in young flowers are closely appressed to the stigma; the petals closely surround these, coming off as a calyptra after fertilization; and the sepals enclose the other flower-parts. In view of the disjunct range and the apparently self-fertilized flowers, it is not surprising that the populations vary in their morphological characters. Three varieties of this species have already been proposed. The purpose of this paper is to propose another taxon of this species and to indicate how it varies from the others.

CALYPTRIDIUM PARRYI A. Gray, Proc. Amer. Acad. 22:285 (1887).

Plants fleshy annuals with a somewhat woody tap root, with several to many prostrate to decumbent to erect stems branching from the base, to 1 dm. long, these in turn branched or not, glabrous throughout; basal leaves in a rosette, fleshy, spatulate, 1–3 cm. long; cauline leaves alternate, spatulate to oblanceolate, 1–3 cm. long, obtuse; flowers perfect, racemose or paniculate, sometimes secund, sometimes imbricate, the lower pedicellate or subsessile and sometimes in the axils of cauline leaves, the upper subsessile or sessile and somtimes subtended by small scarious bracts, articulation with the rachis evident or not; sepals 2, the abaxial ovate to reniform, with a white scarious irregular margin or this lacking, 2–4 mm. long, adaxial sepal smaller and narrower; petals usually 4, white, quickly deciduous and forming a temporary calyptra over the capsule; stamens 1 to 3; ovary 1-celled with basal placentation; ovules on slender funiculi of different lengths; stigma 2-lobed, sessile; capsule 2-valved, dehiscent, ovate to oblong, obtuse, 3–7 mm. long, usually about twice the length of the fruiting abaxial sepal, the lower portion of the valve with at least 10 fine parallel veins, the upper portion thicker and appearing minutely warty-tuberculate; seeds round biconvex disks in the basal ½ to ⅔ of the capsule, 10 to 15, black, tuberculate or not, 0.5–0.75 mm. in diameter (as measured perpendicular to the diameter through the micropyle).

KEY TO THE VARIETIES

Seeds not completely smooth, with tubercles at least along the margin; pedicels articulate with the rachis.

Seeds with tubercles throughout, dull; flowers persistent. Mountains of southern California.....1. var. *Parryi*

Seeds with tubercles only on the small wing-like margin, central portion of lateral convex surface shiny; flowers not persistent.

Seeds over 0.65 mm. in diameter; abaxial fruiting sepal reniform with a wide scarious margin. Southern Nevada and Inyo County, California ..... 2. var. *nevadense*

Seeds under 0.6 mm. in diameter; abaxial fruiting sepals usually ovate with a very narrow scarious margin or none. Santa Cruz and Santa Clara counties, California ..... 3. var. *Hesseae*

Seeds completely smooth, shiny, lacking tubercles; pedicels not articulate with the rachis. Southeastern Arizona..... 4. var. *arizonicum*

1. Calyptridium Parryi A. Gray var. Parryi, loc. cit. *C. Parryi* A. Gray var. *typicum* J. T. Howell, Leaf. West. Bot. 4:214 (1945).

Flowers usually persistent; pedicels appearing jointed; abaxial sepals usually broader than long and with a conspicuous scarious margin; seeds not shiny, covered with small tubercles, 0.65–0.75 mm. in diameter.

Type. San Bernardino Co.: Mohave slope of the San Bernardino Mountains, Bear Valley, *Parry & Lemmon,* 1876 (G).

Mt. Pinos to the San Antonio, San Bernardino, and San Jacinto mountains in southern California and in the southern Sierra Nevada, from 5000 to nearly 11,000 feet on sandy flats or on loose rocky slopes, often locally abundant. June and July and at higher altitudes to the middle of September.

Representative specimens examined. Ventura Co.: Griffins, Mt. Pinos, *Elmer 3948,* July, 1902 (CAS, DS). Riverside Co.: Pine Mt., *I. M. Johnston s. n.* July 6, 1918 (UC); Strawberry Valley, San Jacinto Mountains, *E. C. Jaeger s. n.,* June 30, 1921 (DS); San Jacinto Peak, *W. W. Swarth s. n.,* Sept. 14, 1914 (CAS). San Bernardino Co.: near summit of Mt. San Antonio, *Abrams 1929,* July, 1901 (DS); Bear Valley, *Parish 1800,* June, 1885 (DS, paratype); South Fork of Santa Ana River, *Howell 23485,* July 22, 1947 (CAS). Inyo Co.: end of Mt. Whitney Road, *M. Kerr s. n.,* June 14, 1937 (CAS).

2. Calyptridium Parryi A. Gray var. nevadense J. T. Howell, Leaf. West. Bot. 4:216 (1945).

Flowers deciduous; pedicels articulate with the rachis; abaxial sepals usually broader than long with a white scarious margin; seeds with tubercles along margin, the central portion shiny, about 0.65 mm. in diameter.

Gold Mountain, Esmeralda County, Nevada, and Panamint Mountains, Inyo County, California, from about 7000 to 8000 feet in sandy soil of canyon washes.

Specimens examined. Nevada. Esmeralda Co.: Gold Mountain, *Keck 559,* June 23, 1930 (DS, type; CAS, UC). California. Inyo Co.: Wild Rose Canyon, *Munz 14864,* July 7, 1937 (CAS); Surprise Canyon near Panamint City, *Howell 3912,* June 14, 1928 (CAS).

3. **Calyptridium Parryi** A. Gray var. **Hesseae** J. H. Thomas, var. nov.

Flores decidui; sepalis abaxillaribus ovatis usque ad orbicularibus, marginibus scariosis angustis vel nullis; seminibus 0.5–0.59 mm. diametro, margine tuberculatis.

Flowers readily deciduous; pedicels articulate with the rachis; abaxial sepal ovate to occasionally orbicular, with a narrow scarious margin or none; seeds 0.5–0.59 mm. in diameter, tuberculate on the margin, the convex surfaces shiny.

Known from Ben Lomond Mountain and Loma Prieta in the Santa Cruz Mountains and from the Mt. Hamilton Range, central California, from about 2300 to 3500 feet. June to the middle of August.

Specimens examined. Santa Cruz Co.: Ben Lomond Mountain, southwest of Eagle Rock, *Hesse 1288*, June 3, 1954 (DS); *Hesse 1317*, July 2, 1954 (CAS, type, DS); *Hesse 1370*, Aug. 13, 1954 (CAS); slope of Loma Prieta, *Hesse 972*, July 11, 1952 (DS). Santa Clara Co.: northeast slope of Mt. Santa Isabella, *H. K. Sharsmith 3381*, June 16, 1935 (DS, UC).

It is a pleasure to name this variety for Miss Vesta F. Hesse, a resident of Boulder Creek, Santa Cruz County, who through her careful and discriminating collecting in the Santa Cruz Mountains, has added many valuable specimens to the herbaria of the California Academy of Sciences, the University of California, and Stanford University.

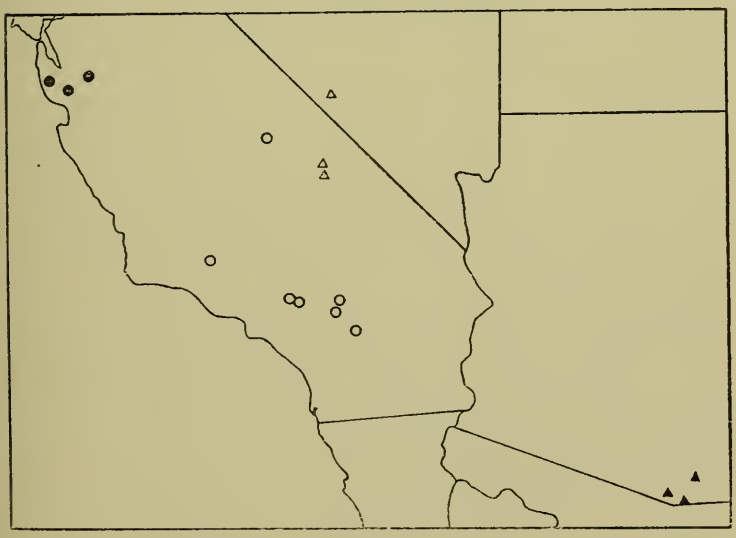
4. Calyptridium Parryi A. Gray var. arizonicum J. T. Howell, Leaf. West. Bot. 4:215 (1945).

Flowers persistent; pedicels not articulate; sepals broad with a wide margin; seeds completely smooth and shiny, about 0.7 mm. in diameter.

Type. Pima Co.: hills above Rosemont, *Griffiths 4125*, Mar. 13 to Apr. 23, 1903 (US).

Pima and Santa Cruz counties, Arizona, and probably in adjacent Mexico, usually from 3500 to 5000 feet. March through the first half of May.

Specimen examined. Santa Cruz Co.: near Nogales, *Peebles & Fulton 11454*, May 5, 1935 (CAS, paratype).



Distribution of *Calyptridium Parryi*: var. *arizonicum*, shaded triangles; var. *Parryi*, open circles; var. *nevadense*, open triangles; var. *Hesseae*, shaded circles.

THE GLOBOSE-HEADED FORM OF JUNCUS ACUMINATUS

BY F. J. HERMANN

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The flower-heads in the widely distributed *Juncus acuminatus* Michx. are ordinarily hemispheric to broadly obpyramidal and few- to several-flowered. But sporadically throughout the range of the species, and more commonly in the Southwest, a form occurs with spherical, many-flowered heads which has repeatedly proven puzzling to collectors. Occasionally it is found in herbaria misdetermined as *J. nodosus* or *J. brachycarpus,* or more frequently left with merely generic identification. A dozen years ago the writer proposed to designate this variant as forma *sphaerocephalus* in a treatment of the genus contributed as part of a regional flora, and accordingly annotated several sheets in various herbaria with this name. But after preparation of the manuscript it was found that the form had not been collected quite within the boundaries of the area embraced by the flora so it had to be deleted from the account. The expectation that an early opportunity might arise for its inclusion in another treatment was not fulfilled; and only now has it been found that the plant had already been given varietal status under another species.

From Jepson's brief description (Fl. Calif. 1:255,–1921) of his variety *riparius* of *Juncus Bolanderi* it was suspected that this was very likely *J. acuminatus* and probably the globose-headed form. When John Thomas Howell recently suggested the same conclusion, a loan of the type from the Jepson Herbarium was secured, through the kindness of Dr. Rimo Bacigalupi, and this at once confirmed the suspicion of its identity with *J. acuminatus* f. *sphaerocephalus.* Subsequent examination of the material in the U. S. National Herbarium revealed that Engelmann also recognized the form and correctly referred it to *J. acuminatus,* although there is no reference to it in his "Revision of the North American Species of the Genus Juncus" (Trans. Mo. Acad. Sci. 2:424–498,—1866–68). Nor did he ever publish the quadrinomial "*J. acuminatus* Michx. var. *legitimus* Engelm. Revis., *paucicapitatus*" under which he distributed *No. 55* in his Herbarium Juncorum Boreali-Americanorum Normale (*E. Hall,* July 2–16, 1866, Athens, Ill.).

Jepson collected the type of his *Juncus Bolanderi* var. *riparius* in October, 1893, "on the Lower Sacramento River near Rio Vista" [Solano County], California. In 1919 he submitted it to Dr. F. V. Coville who referred it to *J. Bolanderi* Engelm. and it was so distributed under the number 26a. That Jepson was not satisfied with this disposition of the plant is evidenced by a notation in his field book that the "perianth and infl. are quite different from *J. bolanderi* of the coast. I do not understand Coville's det." And in October, 1919, he attached the following note to his specimen. "The genuine *J. bolanderi* of the coast has larger heads which are very *dark* and *compacted.* The perianth segs. in the coast form are almost bristly—almost suggestive of an Eryngium head. So I do not understand Coville's det. Yet further—the coast thing occupies a uniform and distinctive climatic zone which is very different from the habitat of this plant, no. 26a." But despite his misgivings Jepson proposed varietal status for the plant in 1921, still under *J. Bolanderi,* with his collection number now changed from 26a to 29a.

As a form this plant may appropriately be known as **Juncus acuminatus** Michx., f. **sphaerocephalus,** forma nova, capitulis globosis multifloris plerumque paucis. It may readily be separated from *J. Bolanderi* by the following key.

Culms arising from stout, creeping rhizomes; heads subsessile, generally congested into 2 to several, principally terminal, glomerules; sepals linear to narrowly linear-lanceolate, long-attenuate; capsule oblong, not broadened toward the base, tipped with a persistent style-base about 0.5 mm. long ..... *J. Bolanderi*

Culms densely cespitose, creeping rhizomes absent; heads conspicuously peduncled, usually scattered and not chiefly terminal; sepals lanceolate, conspicuously widened at the base, acute to acuminate; capsule ovate, clearly broadened toward the base, the style-base 0.25 mm. long or less. *J. acuminatus* f. *sphaerocephalus*

Representative collections of *J. acuminatus* f. *sphaerocephalus,* in addition to the two cited above, are the following.

MEXICO: swamps, Valley of Zamora, 5000 ft., Michoacan State, *C. G. Pringle 9464* (distributed as *J. microcephalus* H.B.K.); Majalca, Chihuahua, *H. LeSueur 1123.*

ARIZONA: Chiricahua Mts., *Lemmon 309* [as *J. acuminatus* var. *diffusissimus* (Buckley) Engelm.].

CALIFORNIA: in irrigation ditch, Modesto, Stanislaus Co., *R. F. Hoover 103.*

WASHINGTON: in pond, Pleasant Valley, Whatcom Co., *W. C. Muenscher 8838.*

TEXAS: Fern Canyon, Davis Mts., Jeff Davis Co., *V. L. Cory 9617* (as *J.*

nodosus L.); also *B. H. Warnock T257*; Bastrop, Bastrop Co., *B. C. Tharp 962* (mixed with *J. brachycarpus* Engelm.); Gonzales Co., *B. C. Tharp 10509*; fallow rice field, Tex. Agric. Exper. Sta., Beaumont, Jefferson Co., *Mrs. B. W. Higinbotham 40*; bog off U. S. 175 between Elam and Seagoville, Dallas Co., *Lundell & Lundell 10625*.

Missouri: Buckner, Jackson Co., *B. F. Bush 6782*.

Indiana: muddy edge of pond, ½ mile east of Bartlettsville, Lawrence Co., *R. M. Kriebel 2057*; Pinhook bog, 6 miles west of La Porte, Laporte Co., *C. C. Deam 55,275*.

Michigan: Frank Reed marsh, Vicksburg, Kalamazoo Co., *F. W. Rapp 2624–1*.

New York: Verono Beach, Oneida Lake, *J. V. Haberer*, Sept., 1900.

Pennsylvania: on serpentine, Nottingham Barrens, Chester Co., *F. W. Pennell 1444*.

PUGILLUS ASTRAGALORUM XVII: FOUR NEW SPECIES AND ONE VARIETY

BY R. C. BARNEBY

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Astragalus siliceus Barneby, spec. nov. ex affinitate *A. gilensis* Greene et *A. cremnophylacis* Barneby, ab illo habitu pulvinato racemoque 1–3-floro foliis superato (nec plurifloro exserto), ab hoc (habitu simili sed omnibus partibus minori) floribus subduplo longioribus, carina 7.5–8.7 (nec 3.7–4.3) mm. longa, legumine multo majori de latere compresso nec dorso depresso procul distans.

Herba densissime caespitoso-pulvinata acaulescens e radice verticali crassa lignosa diutius perduranti, foliis in ultimis caudicis suffruticulosi ramulis (stipulis marcidis squamuloso-columnaribus) rosulatis, pube appressa dolabriformi praeter petala undique sericeo-cana; stipulae submembranaceae ovato-lanceolatae imbricatae semiamplexicaules inter se liberae 1.5–3 mm. longae; folia 0.5–3 cm. longa imparipinnata, foliolis sessilibus sed omnibus articulatis confertis (1) 2–4-jugis elliptico-oblanceolatis acutiusculis conduplicatis 1.5–5 mm. longis; pedunculi graciles foliis multo superati 1.5–6 (11) mm. longi in racemum laxum 1–3-florum abeuntes, floribus adscendentibus; pedicelli gracillimi 2.2–3.5 mm. longi, fructiferi vix mutati; calycis ebracteolati 4–5.9 mm. longi sericeo-strigulosi tubus campanulatus 3.2–4.2 mm. longus demum ruptus, dentes subulati 0.8–1.8 mm. longi; petala purpurea in sicco coerulescentia, vexilli limbo saturatius striato, alis apice pallidis; vexillum leviter (per 40°) recurvum spatulato-oblanceolatum vel obovatum longe cuneatum emarginatum 9.5–11.5 mm. longum; alae 9.4–11 mm. longae, laminis anguste ellipticis elliptico-oblanceolatisve obtusis ambabus subrectis 4.9–7 mm. longis; carina 7.5–8.7 mm. longa, laminis semi-obovatis 3.6–4.5 mm. longis abrupte per 90° in apicem obtusissimum incurvis; legumen adscendens vel patulum sessile, de visu laterali oblique ovatum lentiforme 5–7.5 mm. longum, 2.8–3.8 mm. latum, basi obtusum apice in cuspi-

dem parvam saepissime prorsus decurvam abrupte contractum, totum de latere compressum suturis bicarinatum, sutura ventrali crassiuscula prominula magis convexa, valvulis dense strigulosis immaculatis tenuiter carnosis demum coriaceis, intus filamentosis, haud inflexis; ovula 8–10; semina ignota.

New Mexico: low granite-quartz outcrop on high rolling plains, elevation 6250 ft., southerly foothills of the Pedernal Mts., 3 miles west of Negra, Torrance County, 7 May and 22 May, 1955, in flower and fruit respectively, *Barneby 12,600 & 12,816*. Cotypes in Herb. Calif. Acad. Sci., Nos. 396234, 396233. Isotypes: GH, NY, POM, UTC, RM, US, WS.

This remarkable little *Astragalus* is related to *A. gilensis* Greene and *A. cremnophylax* Barneby. Characters common to all three are the vesture of silvery dolabriform hairs, free stipules, small flowers and small 1-locular fruits of ovoid but variably compressed form which are keeled ventrally by the prominent suture and tipped by a minute declined beak. *Astragalus siliceus* differs very obviously from *A. gilensis,* which ranges through the yellow pine forests of the Mogollon mountain system from southern Apache County, Arizona, to the Black Range in Sierra County, New Mexico,[1] in the pulvinate rather than tufted growth-habit, and in the few-flowered racemes immersed in the leaves. From *A. cremnophylax,* similar in life-form but known at present only from a tiny strip of limestone pavement on the south rim of Grand Canyon, it is readily distinguished by its larger leaves, flowers, and fruits, and by more numerous ovules (8–10 as opposed to 4–6). Further, the pod differs from that of either related species in being laterally compressed and keeled by both sutures, not dorsally flattened or depressed toward the base. The few other North American *Astragali* which combine an acaulescent or subacaulescent mounded growth-form with dolabriform pubescence are related either to *A. spatulatus* Sheld., *A. sericoleucus* Gray, or *A. Kentrophyta* Gray; all are conveniently distinguished from *A. siliceus* by connate stipules, not to mention numerous individual characters.

The landscape around the type-locality of *A. siliceus* might be described as a bleak rolling plain or elevated prairie, where the sandy soil is mantled in thin turf depleted by overgrazing. Other than a sprinkling of shrubby cylindropuntias there is no tall growth. Here and there along the higher ridges leading north

[1] The Herbarium of the University of New Mexico possesses several sheets of *A. gilensis* (kindly loaned for identification by Dr. E. F. Castetter) from the Jemez Mts., Sandoval County, New Mexico. These gatherings mark a northeasterly range-extension of some 170 miles from the nearest stations hitherto known (in the southern half of Catron County).

toward Pedernal Mt. are scattered outcrops of granite and rose-colored quartz, and it was on one of these isolated knolls that the *Astragalus* occurred, apparently confined to an area not over three hundred feet across. Several similar granitic islands within a radius of a few miles were examined but no further colony was discovered. The plants grew sparsely, associated with *Houstonia rubra* Cav., *Paronychia sessiliflora* Nutt., and *Arenaria Hookeri* Nutt. (var. *Hookeri* Maguire, here at its most southerly known station, apparently not recorded hitherto from New Mexico). Wind-blown sand caught among the foliage and impacted in the thatch of persistent stipules and leaf-bases builds up the older plants of *A. siliceus* into dense hard cushions which may reach 3 dm. in diameter.

Astragalus nidularius Barneby, spec. nov., juxta *A. duchesnensem* Jones necnon *A. lancearium* Gray collocanda, sed inter affines legumine stipitato dorso compresso praestans. *A. Coltoni* Jones, habitu necnon legumine pendulo stipitato nostrae haud absimilis legumine aliter compresso et insuper floribus pendulis ulterius distat.

Herba perennis caulescens rigidiuscula sparsifolia, pilis appressis rectis basifixis fere undique cinereo-strigulosa; caules solitarii vel pauci 1.5–3 (3.5) dm. longi e sepulto radicis verticalis collo erecti et adscendentes, per 4–16 cm. subterranei simplices nudi, emersi robustiores et deinde divaricatim ramosi, ramis iteratim ramulosis, ramulis incurvis laxe intertextis ultimis subfiliformibus; stipulae 1.5–6 mm. longae dimorphae, imae majores ovatae obtusae in vaginam chartaceam post petiolum supressum coadunatae (nec vero connatae), caeterae herbaceae triangulari-ovatae semiamplexicaules plerumque recurvae inter se utrinque liberae; folia 1.5–4.5 (6) cm. longa brevissime petiolata, foliolis dissitis 2–4- (5-) jugis linearibus lineari-lanceolatis -oblanceolatisve obtusis vel emarginatis involutis 2–13 mm. longis, foliolo terminali foliorum summorum reductorum in rachin decurrenti caeteris articulatis; pedunculi 4–11 cm. longi folium multo superantes; racemi laxissime 8–33- (vel summi depauperati 3–7-) flori, floribus ad anthesin adscendentibus; pedicelli ad anthesin adscendentes 1.2–2.5 mm. longi, fructiferi firmiores abrupte recurvi vel dejecti 1.5–3 mm. longi; bracteolae 0–2, minutae; calycis nigro-strigulosi 4.8–7 mm. longi tubus campanulatus vel turbinato-campanulatus 4–5.2 mm. longus, 2.7–3.1 mm. latus, dentes subulati 0.8–2 (2.2) mm. longi; petala roseo-purpurea in sicco coerulescentia; vexillum per 45° recurvum late rhombico-obovatum emarginatum 11.2–14 mm. longum, 8–9 mm. latum; alae 10–13.2 mm. longae, laminis oblanceolatis obtusis vix incurvis 7.1–8 mm. longis, 2.8–3.5 mm. latis; carina 8.4–10.3 mm. longa, laminis semi-obovatis 4.7–5.9 mm. longis, 2.7–2.9 mm. latis per 90° in apicem deltoideum incurvis; legumen pendulum stipitatum lineari-oblongum vel -oblanceolatum rectum vel leviter decurvum 2.2–3.2 cm. longum, 3.5–4.5 mm. latum, basi in stipitem gracilem rectum (3.5) 4–6 mm. longum cuneatim contractum, apice breviter triangulari-rostratum, dorso-ventraliter compressum, sutura ventrali prominula obtuse carinatum, dorso

applanatum vel saepius aperte sulcatum, valvulis tenuiter carnosis viridibus vel purpurascentibus strigulosis maturis chartaceis brunneo-stramineis transverse reticulatis, intus filamentosis, haud inflexis; ovula 21–24; semina matura ignota.

UTAH: locally abundant on sandy benches beneath red sandstone cliffs, in pinyon-juniper forest, elevation 5800 ft., near the head of White Canyon, 2 miles below the Kachina Bridge of Natural Bridges National Monument, on the road down to Hite's Ferry, San Juan County, 19 May, 1955, fl. & fr., *Barneby 12,777*. Type in Herb. Calif. Acad. Sci., No. 396231. Isotypes: GH, NY, POM, RM, US, UTC, WS, WTC. Also in the same environment, elevation 5750 ft., about 13 miles below Kachina Bridge, *Barneby 12,781* (CAS, NY).

This species is related to *A. lancearius* Gray and *A. duchesnensis* Jones, closely resembling the former in its repeatedly forking and incurved stems and branches which tend to assume, at least in compactly growing individuals, the bird's-nest architecture of some annual eriogonums, while it somewhat approaches the latter in the dorsoventral compression of the pod. It differs from both, however, in the presence of a well-developed stipe, a feature unique in its immediate group. It can be distinguished further from *A. lancearius* by the more numerous and better-developed leaflets, and from *A. duchesnensis* by the color of the petals, uniformly pink-purple in the present case, conspicuously bicolored in the other, where the white wing-tips contrast with a reddish-purple banner and keel.

On account of their similar stipules and fruits *A. nidularius* must be compared further with *A. lonchocarpus* Torr. and *A. Schmollae* C. L. Porter. Both are larger and coarser plants, differing in general aspect, in details of foliage, larger ochroleucous flowers nodding at full anthesis, as well as other details. *Astragalus Coltoni* Jones, resembling *A. nidularius* in habit, in the purple (but ordinarily larger and always nodding) flowers, and stipitate pod, is readily separated by the lateral compression of the pod-body, which is moreover uniformly glabrous.

Astragalus saurinus Barneby, spec. nov., *A. toano* Jones et *A. rafaelensi* Jones arcte affinis, ab eo imprimis legumine reflexo, ab hoc caulibus brevioribus strictis, foliolis magis numerosis, legumine brevissime cuspidato, ab ambobus leguminis valvulis maturis chartaceis subdiaphanis nec coriaceis aberrans.

Herba robusta perennis multicaulis sparsifolia subjuncea olida (selenium spirans), pilis brevibus appressis subappressisque basifixis fere undique

strigulosa, junioribus partibus cinerascens; caules subfastigiatim erecti e subterraneo radicis crassae lignosae collo orti (1.5) 2–3 dm. longi, basi aphylli, ad nodos 1–3 pedunculum primum praecedentes ramulosi; stipulae 1.5–7 mm. longae dimorphae, imae in vaginam pallidam plurinerviam campanulatam truncatam vel breviter 2-dentatam connatae, superiores subherbaceae triangulari-ovatae vel lanceolatae semiamplexicaules nunc basi contra petiolum brevissime inter se conjunctae; folia (2.5) 3–9 cm. longa, inferiora et media imparipinnata, foliolis 1–4-jugis remotis lineari-filiformibus vel angustissime lineari-oblanceolatis obtusis vel acutiusculis involutis 1–2.5 cm. longis, superiora vel summa in rachin nudum filiformem reducta, foliolo terminali omnium exarticulato lateralibus longiori; pedunculi fortes erecti 7–17 cm. longi folium longe superantes; racemi breviter sed laxe (4) 6–14-flori, floribus mox declinatis, axi fructifero parum elongato (1) 2–6 cm. longo; pedicelli 1-5–2.5 mm. longi mox retro-arcuati, fructiferi incrassati paulum longiores; bracteolae minutae 1–2; calycis (6.4) 7–9.4 mm. longi striguloso-villosuli tubus campanulatus purpurascens 5.6–6.7 mm. longus, 2.8–5.2 mm. latus, dentes late subulati vel triangulares (0.9) 1.2–3.6 mm. longi; petala bicoloria, vexillo carinaque roseo-purpureis, alis candidis; vexillum per 50° recurvum late rhombico-oblanceolatum emarginatum 18–22 mm. longum, 9–13 mm. latum; alae 14.5–20 mm. longae, laminis linearioblongis -oblanceolatisve obtusis subrectis 9.8–14 mm. longis, 2.7–4 mm. latis; carinae 12–16 mm. longae laminae lunatim semi-ellipticae 6.2–8.3 mm. longae, 2.9–4.2 mm. latae, per 85–90° in apicem obtusum incurvae; legumen reflexum sessile, de visu laterali lineari-oblongum vel anguste oblanceolatum rectum vel leviter incurvum, (1.5) 2–3 cm. longum, 4.4–6 mm. latum, basi cuneatim vel sensim angustatum, apice abruptius contractum brevissime cuspidatum, de latere complanatum, suturis prominulis bicarinatum, valvulis tenuiter carnosis viridibus dense vel parce strigulosis demum chartaceis stramineis reticulatis, intus filamentosis, haud inflexis; ovula 19–29; semina brunneo-viridula saepe rubro- vel purpureo-guttulata sublaevia 3.2–4 mm. longa.

Utah (all Uintah County): sandy soil among junipers, draw above headquarters, Dinosaur National Monument, 6 miles north of Jensen, 26 June, 1953, fr., *A. H. Holmgren & S. S. Tillett 9527*. Type in Herb. N. Y. Bot. Gard.; isotype in the writer's collection. Gullied clay hills, on sandstone, elevation 5150–5350 ft., Raven Ridge, 16–18 miles north of Bonanza, 16 May, 1955, fl., *Barneby 12,716*. Cotype in Herb. N. Y. Bot. Gard.; isotypes and paratypes: CAS, RM, US, UTC. Headquarters, Dinosaur Monument, *W. A. Weber 5318* (CAS). Dinosaur Monument, 7 miles north of Jensen, *Wolf & Deaver 5055* (TEX). Small canyon lateral to the Green River, just below Dinosaur Monument, *Barneby 12,714* (CAS, GH, NY, POM, UTC, US).

Astragalus toanus Jones, *A. rafaelensis* Jones, and *A. saurinus*, which together form a small group among the seleniferous *Pectinati* distinguished by great reduction of the lateral leaflets and

by bicolored petals (the white wings contrasting with pink-purple banner and keel), are closely related. Detailed descriptions of *A. toanus* and *A. saurinus* read alike almost word for word up to the pod, and the two are scarcely distinguishable in the flowering condition. In fruit the raceme of *A. toanus* tends to be looser and longer (3–30 cm. as opposed to 1–6 cm. long); and the erect or narrowly ascending pod is woody or rigidly leathery and opaque when ripe, rather than deflexed and of stiffly papery but subdiaphanous texture as in the species here described. The range of *A. toanus* extends across north and north-central Nevada nearly throughout the Humboldt River drainage, east just into Utah (Millard and Box Elder counties), and north to the Snake and lower Bruneau rivers in south and southwest Idaho. But its eastern limit lies some two hundred miles to the west of *A. saurinus.*

Although technically similar to *A. saurinus* in the deflexed or decurved pod, *A. rafaelensis* is less like it in other respects, especially as seen in the field. The usually longer remarkably junceous stems, nearly or quite glabrous and subglaucescent when fresh, are not held stiffly erect but tend to sprawl outward or ultimately droop under the burden of the fleshy fruits, forming plants of low bushy outline rather than the tidy clumps of *A. saurinus.* Furthermore the ellipsoid or oblong-ellipsoid glabrous pod is relatively shorter and broader, of much thicker texture, drying leathery or woody, carinate around the long diameter by thicker and more prominent sutures, and contracted at apex into a stiff and much longer cusp (2.5–4 mm. as opposed to 0.5–1 mm. long).

For purposes of comparison *A. rafaelensis* has been considered here only in the phase which occurs within and around the San Rafael Swell in Emery County, Utah (Cedar Mt. near Woodside, *Jones in 1915,* type; Red Plateau near Woodside, *Ripley & Barneby 8676*; San Rafael River near By Joe Spring, *Ripley & Barneby 4720),* at points about a hundred miles southwest of *A. saurinus* and to the south of the important floristic barrier of the Tavaputs Escarpment. *Astragalus linifolius* Osterh., known to the writer only from parts of the original collections (hills south of Grand Junction, Colorado, *Osterhout 6106, 6557,* NY), was referred by Rydberg (in N. Amer. Fl. 24:287) to *A. rafaelensis,* but may be at least varietally distinct. The pod is similar, but erect, and the flowers are described by the collector

in a letter addressed to Rydberg and preserved with the isotype at New York as "white except for a small purple tip of the keel". More recently *A. linifolius* has been treated by C. L. Porter (in Univ. Wyo. Pub., Bot., 16:31) as a synonym of *A. toanus*. Its status requires study in the light of new material, but it can in any case hardly be confused with *A. saurinus*.

Some early collections of *A. saurinus* seem to have been confused with *A. Coltoni* Jones, the material from Dinosaur Monument referred to the latter by Graham (Bot. Uinta Basin 246) being almost certainly of the present species. *Astragalus Coltoni*, rather similar in foliage but smaller-flowered and with long-stipitate glabrous pods, is unknown as yet from north of Tavaputs Escarpment.

Astragalus pictiformis Barneby, spec. nov., quoad flores et legumina *A. gracilentum* Gray simulans, sed caulium parte subterranea valde elongata demum in caudicem gracilem late repentem hinc inde radicantem transformata, parte emersa abbreviata (1.5–5 cm. tantum longa), racemisque confertis (fructiferis 0.5–2.5 cm. longis) quoad habitum aliena et inter affines omnes ex affinitate *A. flexuosi* Dougl. insignis.

Herba humilis caulescens e collo profunde sepulto radicis gracilis verticalis perennis assurgens, supra soli nivellum pilis adscendentibus subappressisque sinuosis rectisque basifixis dense striguloso-villosula canescens vel cinerea, foliolis bicoloribus inferne (infra pubem) pallidis, superne saturatius viridibus ad medium glabrescentibus; caules singuli vel pauci, apud plantas juniores ex ipsa radice prodeuntes, apud vetustiores hinc inde e caudicis gracilis sepulti parce radicantis ramulis oblique lateque repentibus emissi, per (2) 3.5–40 cm. subterranei, emersi laxe adscendentes 1.5–5 cm. longi plerumque simplices, internodiis confertis; stipulae 1.5–5 (6) mm. longae subdimorphae, sepultae in vaginam campanulatam scariosam glabram truncatam vel breviter 2-dentatam coadunatae, emersae late ovato-acuminatae vel lanceolatae subherbaceae dorso pubescentes amplexicaules brevius connatae; folia (1) 1.5–5.5 cm. longa breviter petiolata, foliolis 4–8-jugis confertis oblongo-ovatis -oblanceolatisve rarius suborbicularibus obtusis retusisve 2–8 (10) mm. longis; pedunculi laxe adscendentes (1) 1.5–5 (6.5) cm. longi, folio breviores et subaequilongi rarius longiores; racemi densiusculi 4–14-flori, floribus primum adscendentibus demum declinatis, axi fructifero parum elongato 0.5–2.5 cm. longo; pedicelli ad anthesin recti 0.8–1.4 mm. longi, fructiferi recurvi paulo incrassati 1.4–2.5 mm. longi; bracteolae saepe 2 minutae, rarius 0; calycis 4–6.3 mm. longi albo-villosuli tubus campanulatus 3–4 mm. longus, 2.4–2.9 mm. latus, dentes subulati 1–2.5 mm. longi; petala pallide carnea, vexillo striato, carina apice purpurascenti; vexillum per 50° recurvum ovato-cuneatum aperte emarginatum 9–11 mm. longum, 6–8 mm. latum; alae 8.7–10.8 mm. longae, laminis oblongo-oblanceolatis -obovatisve obtusissimis vel truncatis subrectis 5.7–7.3 mm. longis; carinae 7–8.9 mm. longae laminae semi-obovatae 4–5.2 mm. longae in apicem deltoideum per 95° incurvae; legumen deflexum subsessile ambitu ob-

longum vel late oblongo-ellipticum saepissime leviter decurvum 1–1.7 mm. longum, 4.5–6 mm. latum, basi in collum obscurum substipitiformem apice in rostrum brevissimum declinatum abrupte contractum, obtuse trigonum, sutura ventrali crassa prominula carinatum, dorso late et aperte sulcatum, valvulis dense striguloso-villosulis primum tenuiter carnosis viridibus vel purpurascentibus demum subcoriaceis brunneo-stramineis transverse reticulatis, intus filamentosis, haud inflexis; ovula (10) 14–18; semina (pauca visa) brunnea laevia circa 2.2 mm. longa.

NEW MEXICO: sandy slopes and along gullies and draws in rolling arid grassland, elevation 6250 ft., 3–4 miles west of Negra, Torrance County, 7 May (fl.) and 22 May (fl. & fr.), 1955, *Barneby 12,605 & 12,812*. Cotypes in Herb. Calif. Acad. Sci., Nos. 396232 & 396230; isotypes: GH, NY, OKLA, POM, UTC. Sandstone mesa, elevation 4800 ft., 10 miles east of Santa Rosa, Guadalupe County, *Ripley & Barneby 7513*. Stony hills with *Nolina* and *Acacia*, 12 miles west of Roswell, Chaves County, *Waterfall 10,561*. TEXAS: dry hillside among scrub-oaks, elevation 5500 ft., Signal Peak, Guadalupe Mts., Culberson County, *Ripley & Barneby in March, 1949* (the last three in the writer's collection).

Astragalus pictiformis has been known for several years in the form of flowering and fragmentary fruiting or sterile specimens hitherto assigned tentatively to *A. gracilentus* Gray or some related form. The flowers and fruits greatly resemble those of *A. gracilentus* (in which I would include *A. Greenei* Gray as a minor variant), and it is the greatly shortened aerial stems, condensed racemes and, especially, the modified caudex and, as a result, the wholly different aspect of the growing plants which entitle *A. pictiformis* to specific rank.

All members of Sect. *Scytocarpi* Gray (Sect. *Flexuosi* Jones or the genus *Pisophaca* Rydb.) are characterized by a subterranean root-crown which gives rise to partly buried annual stems, these often persisting underground as a loosely forking caudex but not rooting at the nodes. The principal stems (disregarding an occasional starveling individual) are as long as and commonly up to two or three times longer than the subterranean portion, and branched upon emergence. In *A. gracilentus* and the perhaps too closely allied *A. flexuosus*, the members of the group with which we are here particularly concerned, the racemes are loose and open, the axis becoming 2.5–13 cm. long in fruit. In the present species the subterranean part of the stems is at least as long as and up to twenty times longer than the shortened and simple leafy exserted part, and the racemes, borne close to the

ground, are shorter and more densely flowered, the fruiting axis being only 0.5–2.5 cm. long. The subterranean stems persist as widely creeping thready rhizomes which root adventitiously from the nodes, these secondary roots often becoming thickened and woody and assuming the function of an independent taproot. Old plants thus form clones connected by a network of slender cords. This peculiar habit of growth, especially well adapted to sandy or other loose and deep soils, is familiar to anyone acquainted with *A. ceramicus* Sheld. (formerly *Phaca picta,* whence the epithet *pictiformis*). The latter differs from *A. pictiformis* in the bladdery-inflated nearly always stipitate pod (sessile only in southeastern Idaho), and in the decurrent terminal leaflet of all or at least most leaves.

Astragalus lentiginosus Dougl. var. **micans** Barneby, var. nov., var. *Coulteri* (Benth.) Jones necnon var. *variabilis* Barneby formis cano-sericeis proxima, ab ambabus radice forte perenni, caulibus inferne induratis valde robustis, indumento densissimo villoso-tomentoso e pilis longioribus (1.2–2 mm. usque longis) constituto absimilis. A var. *variabili* insuper differt dentibus calycinis longioribus 1.4–2.6 mm. longis; a var. *Coulteri* allopatrica.

California: lower slopes of sand dunes at southeast end of Eureka Valley, east of Inyo Mts., Inyo County, elevation 3050 ft., May 13, 1955 (fr.), *John C. Roos 6354,* and at the same place, elevation 3100 ft., April 9, 1955 (fl.), *Munz & Roos 20,851.* Cotypes (and photographs of the plants *in situ)* in Herb. Rancho Santa Ana Bot. Gard. First discovered in the same place, Sept. 18, 1954, *Munz & Roos 20,153.*

In view of the known variability of all forms of *A. lentiginosus* it may well seem imprudent to describe a variety to accommodate a single population, but I am unable to dispose otherwise of these remarkable plants. The var. *micans* is closely related to var. *Coulteri* (Benth.) Jones and var. *variabilis* Barneby and can be distinguished from the former and from the more silvery-pubescent forms of the latter only with difficulty. Two small features of var. *micans* stand out as unique in this alliance: the length of the longer hairs (1.2–2 mm. as opposed to 0.5–1, in var. *Coulteri* exceptionally 1.2 mm. long), and the extraordinarily robust habit of growth. The allied forms are short-lived perennials rarely persisting over more than two winters and commonly flowering the first season, and the base of the stems never becomes indurated as here. In the length of the calyx-teeth (1.4–2.6 mm. long) var. *micans* nearly approaches var. *Coulteri,* but this is narrowly endemic to the Coachella

Valley (from near Indio north to Morongo and San Gorgonio passes, mostly below 1200 feet altitude), about two hundred and thirty miles south of Eureka Valley. The range of var. *variabilis* lies in the southwestern parts of the Mohave Desert, from the northern foothills of the San Bernardino and Little San Bernardino mountains northward along the foot of the Sierra Nevada just into southern Inyo County. This differs consistently from var. *micans* in the short calyx-teeth (1–1.4, exceptionally 1.5 mm. long) and those forms of it (fma. β and γ as defined by the writer in Leafl. West. Bot. 4:126, 127) with silvery-silky herbage are winter-annuals, the one (fma. γ) extending into Inyo County having in addition smaller flowers and intergrading with var. *Fremontii* (Gray) Wats., which is the common representative of *A. lentiginosus* at low elevations in the Death Valley region. In short it seems probable that var. *micans* represents an independent offshoot of the *Coulteri-variabilis* complex which has acquired a few small distinctive qualities in its isolated dune-habitat in the sink of Eureka Valley, and practical taxonomy is best served by its systematic recognition. It may be noted in passing that endemic subspecies of *Stanleya pinnata* and *Oenothera deltoides* have recently been described from these same dunes by Munz & Roos (in El Aliso 3:115, 118,—1955).

Axonopus a Lawn Weed in Southern California. The carpet grass, *Axonopus compressus* (Sw.) Beauv., which is sometimes cultivated as a coarse lawn grass or ground cover, has appeared in the Pasadena lawn of Joseph A. Geohegan. He regards its occurrence with him as weedy: he did not plant the grass and wishes to eradicate it. Mrs. Grace Cole Fleischman, Senior Seed Analyst with the California Department of Agriculture in Los Angeles, inspected the infestation and writes of it as follows: "The lawn is the typical weedy sort I see all over Pasadena, with crabgrass, veronica, mouse-ear chickweed, oxalis, etc. I did not see the carpet grass scattered over the entire lawn — just in irregular patches in the middle near a water sprinkler that seemed to be leaking a bit." The grass was first sent to Mrs. Fleischman for determination in October, 1954, and she made the above observations and a collection on November 2.—J. T. Howell.

HELIANTHEMUM GUTTATUM NEGLECTED IN CALIFORNIA. One of the conspicuous annual herbs on the lower foothills of the Sierra Nevada near Ione, Amador County, California, is the European plant, *Helianthemum guttatum* (L.) Mill. *(Tuberaria guttata* Grosser) *(Howell 29,809).* Depending on immediate edaphic conditions in open grassy places in the chaparral, the plants vary greatly in habit, those growing in thin sterile soil being depauperate and one- or few-flowered, those growing in deep soil being taller, branched, and many-flowered. When I found the plant on May 18, 1954, only the more robust plants still carried flowers with spreading yellow petals with dark brown base.

This distinctive introduction, so unlike our perennial native species, was reported from the Amador County foothills in 1940 by W. W. Robbins (Calif. Agr. Expt. Sta. Bull. 637, p. 72), but it has not been noted in floristic works nor in "Weeds of California" (1941, 1951). *Helianthemum guttatum* may as yet be restricted in its distribution, but, because of its local abundance and its adaptability, I believe it is here to stay and deserves recognition.—JOHN THOMAS HOWELL.

ANOTHER ORNITHOPUS IN SANTA CRUZ COUNTY, CALIFORNIA. From the same district where Vesta F. Hesse discovered *Ornithopus roseus* Dufour in 1941 (cf. Leaf. West. Bot. 5: 186,—1949) now comes a record of *O. pinnatus* (Mill.) Druce to be credited to the same collector: Graham Hill between Felton and Santa Cruz, elev. about 600 ft., Santa Cruz County, California, *Hesse 1614* (June 14, 1955, in flower) and *Hesse 1653* (July 5, 1955, in fruit). The flowering plants of this slender Old World annual might readily be mistaken for one of our native species of *Lotus,* but such an error will be quickly rectified when one sees the slender legumes disarticulating into small loments. The two species of *Ornithopus,* which I know of in California only from Miss Hesse's collections, may be readily distinguished by characters of foliage, inflorescence, flower-color, and fruit. Because the young fruits of certain species of *Ornithopus* (such as the one we are here reporting) resemble the claws of a bird, the common name for the plants in several European countries is the direct translation of the generic name: Vogelfuss, pied d'oiseau, and bird's foot.—JOHN THOMAS HOWELL.

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BENITOA, A NEW GENUS OF COMPOSITAE FROM CALIFORNIA

BY DAVID D. KECK

The New York Botanical Garden, New York

In late summer on the browning short-grass hot and arid hills of the inner South Coast Range of California, from southern San Benito County to Parkfield Grade, one finds patches of a yellow-flowered composite, as individuals slender and rather inconspicuous. The numerous small heads are held erect on their slender peduncles in the large open corymbose panicle. The stem below is unbranched and moderately leafy with yellow-green foliage that soon develops a reddish cast. The whole plant may be covered with dust from its habitat due to an abundance of stalked glands, which incidentally impart a resiny odor. This plant was first described in 1928 by H. M. Hall, who called it *Haplopappus occidentalis* and added it to the otherwise monotypic section *Isopappus*. At that time the writer was employed as an assistant to Dr. Hall and he was assigned the task of finding as many differences as possible between the new species and *Haplopappus divaricatus* (Nutt.) Gray, which seemed to be its closest relative. Nine sets of characters in which these species differ are compared on page 216 of Hall's monograph (The Genus Haplopappus. Carnegie Inst. Wash. Publ. No. 389, 391 pp.). Many of the differences enumerated there also separate *H. occidentalis* from all other members of the genus. In preparing accounts of *Haplopappus* for Abrams' Illustrated Flora of the Pacific States and for a California flora that P. A. Munz and he have in preparation, the writer has been impressed by the fact that this plant is an aberrant element in *Haplopappus* from many points of view, and that the circumscription of that genus becomes clearer and more natural if this species is excluded from it. Consideration has therefore been given to generic segregation, and the name *Benitoa* is proposed for this monotypic genus. The more important generic differences are tabulated below.

Leaflets of Western Botany, Vol. VIII, pp. 25-40, April 30, 1956.

HAPLOPAPPUS	BENITOA
Disk-florets fertile, their akenes densely pubescent.	Disk-florets sterile, their undeveloped akenes glabrous.
Ray-florets, when present, usually sterile, if fertile their akenes mostly cylindro-turbinate, not obviously obcompressed nor 3-nerved, villous to glabrous, not finely sericeous-puberulent nor patterned.	Ray-florets fertile, their akenes obcompressed, 3-nerved, triangular in cross-section, the superficial nerves peelable, finely sericeous-puberulent in patches, forming a regular mottled pattern on the dark coat of the akene.
Pappus-bristles numerous (12–40 or more), persistent or rarely somewhat deciduous, as long as or longer than the involucre.	Pappus-bristles 1–8, early deciduous, exceptionally slender and fragile, much shorter than the involucre.
Outer phyllaries not tipped with a prominent capitate gland.	Outer phyllaries tipped with a prominent capitate gland.

In addition, *Benitoa* is an annual herb with ligules of the ray-florets becoming revolute into a coil at the tip, yellow often tinged with red, and only about 1 mm. wide. Very few species of *Haplopappus* are annuals, and these belong in the sections *Blepharodon* and *Isopappus*. It is just here, too, that species occur in which the ligule is often revolute, and only in *Blepharodon* and *Hazardia* may it become reddish. The ligule is ordinarily wider in *Haplopappus* than in *Benitoa*.

Benitoa Keck, gen. nov. Capitulum multiflorum, floribus radiorum ligulatis foemineis 1-seriatis fertilibus, fl. disci tubulosis hermaphroditis 5-dentatis. Involucrum cylindro-turbinatum, 5- vel 6-seriatum imbricatum, squamis 30–50 corneis lineari-attenuatis exterioribus apice subpatulo glandulam pedicellatam gerentibus. Achaenia radiorum trigona puberula, disci linearia glaberrima abortiva. Pappus disci et radiorum 1–8 setis tenuissimis flexuosis deciduis constans.—Herbae annuae xerophyticae cymoso-paniculatae ramosae omnino aspere glanduloso-pubescentes aromaticae. Folia alterna reticulato-venosa integerrima sessilia. Capitula lutea roseo-tincta pedicellata. (Named for San Benito County.)

Monotypic.

Benitoa occidentalis (Hall) Keck, comb. nov. *Haplopappus occidentalis* Hall, Carnegie Inst. Wash. Publ. No. 389:214, fig. 72 (1928).

This uncommon endemic of the Diablo Range occurs in colonies that sometimes color entire fields from north of Cook, southern San Benito County, southward through Peachtree and Priest valleys in Monterey and Fresno counties to the north side of Parkfield Grade, the type locality. It is a member of the Foothill Woodland plant community at elevations of 1200 to 3200 feet, with *Pinus Sabiniana, P. Coulteri, Quercus Douglasii, Aes-*

culus californica, Haplopappus squarrosus subsp. *stenolepis, Hemizonia Lobbii,* etc., and is perhaps confined to serpentine soils. It blooms from late June to November.

In addition to the collections cited by Hall, there are: near Hernandez, San Benito County, Aug. 17, 1933, *J. T. Howell 11549* (CAS, NY); 18 miles east of San Lucas, Monterey County, about 1500 feet altitude, Sept. 29, 1928, *Keck 469* (CI); Priest Valley, San Benito County, Sept. 22, 1920, *L. R. Abrams 7676* (DS, NY); 3.5 miles southeast of Priest Valley post office, Fresno County, 1500 feet altitude, and noted that it was common for seven miles southeastward, Sept. 29, 1928, *Keck 470* (CI, DS, K, POM, UC); range south of Jacalitos Creek, Fresno County, June 13, 1938, *Eastwood & Howell 5862* (CAS, NY); 5.7 miles north of summit of Parkfield Grade, Fresno County, 1200 feet altitude, Aug. 31, 1955, *Peter H. Raven 8792* (CAS, NY, duplicates to be distributed); northeastern end of summit of Parkfield Grade, Fresno County, topotype, *Raven 8798* (CAS, NY).

Hall attempted to make a case for deriving this plant from *Haplopappus divaricatus* (Nutt.) Gray of the section *Isopappus.* The latter plant grows in the southeastern United States from South Carolina and Florida to Texas, and habitally it bears a strong resemblance to *Benitoa.* Its leaves, although spiny-toothed, are similarly thickish and veiny, its stems are glandular-pubescent, and even its ligules may become tightly revolute. Attention may be called to the fact, however, that in other characters some similarity may be found between *Benitoa* and some members of the section *Blepharodon,* of the southwestern United States and Mexico, in which one also finds the annual habit, revolute ligules, which in addition may turn reddish as in *Benitoa,* and rather firm linear-subulate phyllaries. Hall made a primary separation of the sections of *Haplopappus* on the basis of head-size, but this has since been questioned by a few, and the present instance bears on the point. Hall kept *Blepharodon* among the large-headed sections, and *Isopappus* among the small-headed. Actually, the heads of *H. divaricatus,* although narrowly campanulate, are not fundamentally different from those of the smaller-headed members of the section *Blepharodon,* which are broadly campanulate to hemispheric, and on the strength of the many other obvious similarities it would seem to be better to unite the now monotypic section

Isopappus with section *Blepharodon*. In any case, *Benitoa* has surely had a long independent evolutionary history, and whether it has been derived from the relatively primitive *Blepharodon-Isopappus* complex in *Haplopappus* or from a precursor of that genus is not certain. It does appear to stand sufficiently apart from all other species to warrant generic status.

A NEW WYOMING SEDGE

BY F. J. HERMANN

Plant Industry Station, Beltsville, Md.

Carex limnophila F. J. Hermann, spec. nov. (Ovales). Caespitosa; culmi graciles folia superantes; folia ad basim culmi maxima ex parte aggregata, vaginis teneris non artis ventraliter albidis; spicae 4–8 gynaecandrae in capitulum fusco-nigrum terminale 7–12 mm. longum, 5–10 mm. latum confertae; squamae lanceolatae breviacuminatae; perigynia tenuiter membranacea, plano-convexa, ovato-lanceolata vel anguste lanceolata, 2.5–3.25 mm. longa, 1–1.3 mm. lata, valde alata in rostrum serrulatum angustum 1.5 mm. longum apice teres attenuata; achaenia lenticularia ovoidea substipitata.

Cespitose; culms 2–4.5 dm. high, slender, obtusely triangular below, sharply so below the heads, weakly scabridulous above, otherwise smooth; lowest 2 or 3 leaves with rudimentary blades; leaves with well-developed blades 3 to 5 to a fertile culm, mostly on the lower half of the culm and ⅓ to ⅔ its length, the blades flat, linear, 6–17 cm. long, 1.5–3.25 mm. wide, scabridulous on the margins and midrib toward the attenuate apex, the sheaths loose, ventrally white-hyaline, thin and fragile, prolonged 0.5–1 mm. at the throat beyond the base of the blade, the ligule wider than long; head ovoid to oblong, 7–12 mm. long, 5–10 mm. wide, dull dark olive-brown to blackish-brown; spikes 4 to 8, gynaecandrous, aggregated, 4–6 mm. long, 3–4 mm. wide, rounded at the base, the apex truncately obtuse at maturity, the perigynia ascending; bracts scale-like except the lowermost which is generally setaceous and 10–12 mm. in length; scales lanceolate, short-acuminate, 2–2.5 mm. long, 0.75–1 mm. wide, about the length of the bodies of the perigynia, dark olive-brown, glossy, the midvein slender and mostly inconspicuous (except sometimes towards the base) or obsolete; perigynia thin, plano-convex to shallowly convex, ovate-lanceolate to narrowly lanceolate, 2.5–3.25 mm. long, 1–1.3 mm. wide (averaging 3 x 1.25 mm.), membranaceous, drab-brown ventrally, blackish-brown dorsally, the body ovate to elliptic, obscurely nerved or nerveless dorsally, nerveless ventrally and generally with 1 or 2 conspicuous transverse folds across the center of the body, strongly winged to the base, doubly serrate to below the middle, rounded at the slightly spongy base, tapering or contracted into a slender beak about 1.5 mm. long, obliquely cut dorsally, dark brown to black, the tip terete, almost imper-

ceptibly bidentulate and hyaline; achenes lenticular, ovoid, 1 x 0.75 mm., substipitate, apiculate, stramineous to grayish-brown and minutely red-flecked; stigmas two, slender, reddish-brown.

WYOMING: associated with *Carex Douglasii, Juncus longistylis,* and *Oxytropis deflexa* var. *sericea* on gravelly edge of road bordering willows on north shore of Half Moon Lake, altitude about 7500 ft., Wind River Mts., 7 miles northeast of Pinedale, Sublette County, Aug. 21, 1955, *F. J. Hermann 12252* (US, type, CAS, RM, NA); growing with *Luzula Piperi* on abrupt, mossy shore of Bridge Bay, Yellowstone Lake, altitude about 7800 ft., 3 miles southwest of Lake Junction, Yellowstone National Park, Sept. 12, 1955, *F. J. Hermann 12527* (US, MONT, NA).

Carex limnophila is most nearly related to *C. Haydeniana* Olney (*C. nubicola* Mack.) from which it is readily distinguished by its small heads and its much smaller perigynia (3 mm., rather than 4.5–6 mm., long) which are brown throughout rather than "greenish straw-colored, tinged with brown," and have a more constant and deeper ventral fold. In habit the new sedge is much more suggestive of *C. illota* Bailey, the small, blackish heads of both species being of the same size and strikingly similar in appearance, but *C. illota* is very different in its plump, almost wingless perigynia, because of which it is perhaps more naturally placed in Section *Stellulatae* than in Section *Ovales.*

THE SUBSPECIES OF PHACELIA NEMORALIS GREENE

BY L. R. HECKARD

During the course of investigating the members of *Phacelia magellanica* polyploid complex in California (Heckard, 1954), it has become increasingly apparent that plants of *P. nemoralis* Greene of the moister foothills of the Coast Ranges of central California are recognizably different from plants occupying a somewhat similar habitat in the Pacific Northwest. This morphological difference, although slight, is supplemented by evidence from chromosome counts. A survey of chromosome numbers in this species has shown that the central California plants are all diploid (n = 11) while those from the Pacific Northwest are tetraploid. Herbarium specimens of plants of the two levels of ploidy are often difficult to distinguish owing to overlapping variation, but certain slight differences are present rather con-

sistently, especially those which are seen when the plants are in cultivation side by side. It would seem that the goals of taxonomy are better served by recognizing the plants of the Pacific Northwest as a subspecies. This treatment expresses the close relationship of plants of the two levels of ploidy, a feature which would be lost by assigning the tetraploids specific rank as a result of rigidly applying a genetic definition of a species.

Phacelia nemoralis Greene subsp. **oregonensis** Heckard, subsp. nov. Caulis unico vel caules plures crassi (diametro longitudinis dimidio 7–10 mm.) 5–20 dm. alti; rosulae foliis maturis foliolorum paribus duobus vel pluribus flavido-viridibus vel atro-viridibus rugosis supra sparse appresso-hispidis, 10–25 cm. longis, 4–9 cm. latis; corolla eburnea, 5–6 mm. longa, 4–5 cm. lata; seminibus unicis vel duobus, 2–2.5 mm. longis.

Stems one to several, stout (usually 7–10 mm. in diameter for one-half their length), 5–20 dm. high; mature rosette leaves yellow-green to dark green, rugose and sparsely appressed-hispid on upper surface, 10–25 cm. long, 4–9 cm. broad, with 2 or more pairs of leaflets; corolla yellowish-white, 5–6 mm. long, 4–5 mm. broad; seed 1 or 2, 2–2.5 mm. long.

TYPE: Sauvies Island, 4 miles north of Burlington ferry, Multnomah County, Oregon, *Constance & Beetle 2674* (UC 671710); n = 22.

Habitat and distribution. Shaded or partially shaded banks and roadsides, often associated with thickets or luxuriant roadside vegetation; west of the Cascade Mountain axis in Washington, Oregon, and northwestern California, sea level to approximately 2000 feet.

Tetraploid chromosome vouchers.* WASHINGTON. Pacific County: near Megler Ferry landing along Columbia River, *Heckard 591.* OREGON. Multnomah County: Multnomah Falls, *Heckard S-173* (seed collection by Francia Chisaki). Clackamas County: West Bluffs, Willamette River falls, Oregon City, *Constance & Beetle 2767;* Zigzag River, 1.3 miles above Rhododendron, 2000 feet, *Constance & Beetle 2778.* Marion County: Silver Creek Falls State Park, *Heckard T-266* (transplant collected by C. R. Bell). Linn County: near Calapooya River, 3 miles north of Shedd, *Constance & Beetle 2782.* Tillamook County: ocean bluffs at Short Sands Beach State Park, 4.5 miles northwest of Nehalem, *Heckard 592;* 3 miles north of Neskowin, *Constance & Beetle 2643.* Lincoln County: Cape Perpetua, *Constance & Beetle 2643.* Coos County: bluffs, 300 feet above ocean, Humbug Mountain State Park, *Heckard 595* (specimen intermediate towards *P. argentea);* 2 miles east of Bridge, *Kruckeberg 3314.* CALIFORNIA. Del Norte County: west of Myrtle Creek, along Smith River, *Heckard 265.* Humboldt County: summit of Table Bluff, 12 miles south of Eureka, *Constance & Beetle 2609.*

Other representative specimens (uncounted). WASHINGTON. Pierce County: Carbon River bridge, below Fairfax, *H. E. & S. T. Parks 682.* Thurston County: Olympia, 18 June 1904, *E. C. Townsend.* Lewis County: Lewis and Clark State Park, *J. T. Howell 7341* (CAS). Grays Harbor County: near Montesano,

*Unless otherwise designated the specimens are in the Herbarium of the University of California, Berkeley. Professor Lincoln Constance and Dr. Marion Cave of that institution have kindly made available their chromosome vouchers for this study.

A. A. & G. E. Heller 3923. Wahkiakum County: Altoona, *Suksdorf 6677.* Cowlitz County: 2 miles southeast of Kelso, *Constance & Beetle 2781.* OREGON. Lane County: McKenzie River Valley, 3 miles east of Walterville, *Eastwood & Howell 1584* (CAS). Hood River County: Columbia River Gorge, *Benson 2270.*

The diploid plants of *P. nemoralis* constitute a morphologically homogeneous group, limited in its distribution to the moister foothills of the California Coast Ranges from San Luis Obispo County north to Sonoma County. The tetraploid plants (subsp. *oregonensis),* on the other hand, exhibit considerably more morphological variability. The greatest constancy of characters is found in the plants of the lowland areas of Oregon and Washington west of the Cascade Mountain crest. These plants differ most conspicuously from those of subsp. *nemoralis* in the following features:

subsp. *nemoralis*	subsp. *oregonensis*
Stems slender, rarely exceeding 7 mm. at midpoint.	Stems stout, usually 7–10 mm. in diameter at midpoint.
Branches of inflorescence loosely disposed along stem.	Branches of inflorescence more compactly arranged along stem.
Mature rosette leaves yellow-green, with one pair of lateral leaflets (occasionally 2), the upper surface of leaf sparsely hispid.	Mature rosette leaves green, with 2 or more pairs of lateral leaflets, the upper surface of leaf rugose and sparsely appressed-hispid or strigose.
Corolla greenish-white, 3.5–5 mm. long and 3.5–4.5 mm. broad.	Corolla yellowish-white, 5–6 mm. long and 4–5 mm. broad.

In the Cascade Mountains of south-central Washington, difficulties occasionally arise in separating subsp. *oregonensis* from *P. leptosepala* Rydberg (Kruckeberg, in press), while in similar areas south of the Columbia River intergrades are found between subsp. *oregonensis* and the montane tetraploid *P. mutabilis* (for example, *Constance & Beetle 2678).* Plants have been collected on the sea bluffs of Curry County, Oregon *(Peck 20392, Eastwood & Howell 3620, Heckard 595)* which indicate the influence of genes from the sand dune *P. argentea* Nels. & Macbr. At the southern limit of distribution of subsp. *oregonensis* in northwest California (Del Norte and Humboldt counties), a complex mélange of plants is encountered which occupies the habitat of the subspecies, but which varies in the direction of other tetraploid taxa of the area. While the "nemoraloid" features of

rank habit and large stem size are retained, other features such as increased corolla size, less hispidity, and more densely strigose leaf surface are developed to varying degrees. A fuller account of this variability and its documentation is to be presented in the author's forthcoming treatise of the California members of the *P. magellanica* complex. These intergradations are typical of the variation pattern which is encountered on the tetraploid level throughout this polyploid complex. Taxa must be interrupted somewhat arbitrarily in order to apply a practical system of nomenclature to the major recognizable plateaus of morphological uniformity.

References

Heckard, L. R. 1954. VIII Cong. Int. Bot. Rapp. & Comm. Sect. 9: 72,73.
Kruckeberg, A. R. 1956. Madroño, in press.

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NOTES ON THE FLORA OF IDAHO—I

BY WILLIAM H. BAKER

University of Idaho, Moscow

In 1950 the University of Idaho initiated Special Research Project No. 31, entitled "A Taxonomic and Distributional Survey of Aquatic, Range, and Weed Plants of Idaho." The work is now in its fifth year. Collections during this period have resulted in an accumulation of over 5000 specimens which have been deposited in the University of Idaho Herbarium. Many of these were collected in sets of 10, making available approximately 50,000 specimens for exchange with other herbaria. A series of papers is planned, as the work progresses, dealing with the more interesting plant records which are being obtained during the study.

The plants listed in the present report are for the most part new to the state. The plants discussed here and in future papers will fall into five general categories: (1) plants which have been introduced or have become naturalized along roadsides, in wastelands, or in cultivated or irrigated sections, these consti-

tuting a group of considerable importance in our flora today; (2) plants which previously have been listed as "probably occurring in Idaho" based on the presence of the species in states adjacent to Idaho; (3) plants which have been listed in older reports as growing within the state but for which no material is at present available for study; (4) native Idaho plants which for lack of previous intensive plant exploration have been overlooked; (5) any unusual distributional records which may prove to be of sufficient interest to warrant further discussion.

All of the collections mentioned are the author's except as noted in the text. Appreciation is expressed to R. C. Barneby, F. J. Hermann, C. L. Hitchcock, J. T. Howell, E. R. Sohns, and J. R. Swallen for help with the identification of certain critical specimens.

AEGILOPS CYLINDRICA Host. Waste ground, a weed on the campus of University of Idaho, Moscow, Latah County, *No. 9090*. A native of southern Europe which is becoming a serious weed pest in the midwest and New Mexico. St. John (3) records it as an established weed in grassy places around Pullman, Whitman County, Washington.

AGROSTIS VARIABILIS Rydb. Frequent, dry rocky wash, above Sawpit Creek, about 2 miles south of Silver City, Owyhee County, *No. 8286* (US). This plant has apparently often been included in *A. Rossae* Vasey in the floras covering our area. It is found along rocky creek banks and on mountain slopes from British Columbia to California and eastward through Idaho, Nevada, Utah, and Colorado.

ERAGROSTIS ORCUTTIANA Vasey. Frequent, dry roadsides, 10 miles south of Nampa, Canyon County, *No. 8340* (US). Duplicate identified by E. R. Sohns and J. R. Swallen. This is the first collection of the species in Idaho, although it has been recorded previously from Oregon (ballast, Portland), California, Nevada, Arizona, and Colorado.

HORDEUM LEPORINUM Link. Frequent, roadside weed at Oakley, Cassia County, *No. 8668* (US). Not previously known from Idaho. It is present in the states immediately adjacent to Idaho on the west and south, having been collected in Oregon, Washington, Nevada, and Utah.

LEPTOCHLOA FASCICULARIS (Lam.) Gray. Occasional, moist soil, along the Snake River at Walters Ferry, Owyhee County,

No. 8591 (US). The first record of this genus in Idaho. The species appears throughout most of the United States, south through tropical America to Argentina. Previously it had been found in all the states west of the Mississippi River except Idaho, Montana, and Wyoming.

ELEOCHARIS BELLA (Piper) Sven. Frequent, moist ground along the banks of Indian Creek, 1.5 miles south of Riddle, Owyhee County, *No. 8479*. Very similar in appearance to *E. acicularis* which is a perennial with creeping rootstocks. Ours differs in being densely tufted with smaller spikelets and anthers. This is the second record for Idaho.

CAREX MULTICOSTATA Mkze. Frequent, wet pools along the lower Sawpit Creek, about 1 mile south of Silver City, Owyhee County, *No. 8240*. Only known from the mountains of Oregon and California. Our record constitutes a considerable extension in range. It has not previously been reported from Idaho.

JUNCUS OCCIDENTALIS (Cov.) Wieg. Frequent, moist stream side, lower Sawpit Creek, about 1 mile south of Silver City, Owyee County, *No. 8245*. Duplicate identified by F. J. Hermann. This is the most eastern locality record to date. It normally ranges from Washington to Oregon, mainly east of the Cascade Mountains, to central California. New to Idaho.

JUNCUS TWEEDYI Rydb. Moist seepage pond at Big Springs Railroad Junction, Fremont County, *No. 9944*. Duplicate identified by F. J. Hermann. This is a perennial species with caespitose rootstocks and it can be easily distinguished from other species by its long-caudate seeds. It has been collected before in bogs and wet meadows from Montana to Wyoming (Yellowstone National Park) and in Utah. This collection is an important extension of the known range into Idaho.

JUNCUS XIPHIOIDES E. Mey. Frequent, moist ground along Birch Creek, near Silent City of the Rocks, Cassia County, *No. 8669*. Duplicate identified by F. J. Hermann. A plant of usually more southern distribution in Arizona and Lower California, northward through Oregon. Our collection is apparently the most northeastern record to date and is the first report for Idaho. The station where it was obtained is just a few miles north of the Utah-Idaho line. It should be looked for in Utah.

DIANTHUS ARMERIA L. Open grassy flat, Falls Point Lookout, above the Selway River, Nez Perce National Forest, Idaho

County, *No. 12454*; waste ground, along the banks of the South Fork of the Clearwater River, 20 miles west of Golden, Idaho County, *No. 12351*; muddy place, near head of the grade into the South Fork of the Clearwater River, main highway northeast of Grangeville, Idaho County, *R. M. Joslyn No. 727*. Apparently well established in this area. The author has collected it in fields and waste ground around Eugene, Oregon, where it is fairly common. Introduced from Europe.

SILENE CONOIDEA L. Wheatfields, south of Tomer's Butte, 4 miles southeast of Moscow, Latah County, *No. 8939*. Identification verified by C. L. Hitchcock. There is also a specimen in the herbarium collected on June 28, 1907, an introduced weed in fields, Moscow, Latah County, which was misidentified as *S. vulgaris* L. This would seem to indicate that it has been present in the area for a long time. It is quite common in wheatfields in adjacent Whitman County, Washington, 3 miles east of Pullman. Hitchcock and Maguire (2) list it as a Eurasian weed. Introduced along the Pacific Coast and in Delaware.

Claytonia linearis Dougl. var. **dichotoma** (Nutt.) W. H. Baker, comb. nov. *Claytonia dichotoma* Nutt. in Torr. & Gray Fl. N. Am. 1:202 (1838). This plant is considered to be synonymous with *C. linearis* Dougl. by Davis (1). The author has studied the abundant material from this area both in the herbarium and in the field, where it grows with the species, and considers it to be at least worthy of varietal status. The following are representative collections: roadside ditch, northeast of Moscow, Latah County, *No. 5783*; moist ditches along the road to Moscow Mountain, about 4 miles northeast of Moscow, Latah County, *No. 5832;* south slope of Tomer's Butte, 4 miles southeast of Moscow, Latah County, *No. 7353*; edge of grassy field, 6 miles west of Athol, Kootenai County, *No. 7363*.

BRASSICA CAMPESTRIS L. Open field, west slope of Tomer's Butte, 4 miles southeast of Moscow, Latah County, *No. 8856*. An abundant weed in the early spring throughout much of Idaho. In addition to the above, there are collections in the herbarium from Bonner, Clearwater, Canyon, Valley, and Nez Perce counties in Idaho.

LEPIDIUM LATIFOLIUM L. Common, edge of field ¼ mile southeast of Weiser, Washington County, *No. 7857*. A tall erect plant with vigorous creeping roots, a troublesome weed in areas which

have been infested. This plant is a newly recorded weed in the rich delta lands of Yolo County and elsewhere in California. It has recently been reported from Montana and is well established along the Atlantic Coast, in Connecticut and Massachusetts. Introduced from Eurasia.

ASTRAGALUS KENTROPHYTA Gray. Infrequent on fine sandy banks, 1 mile north of Bruneau, Owyhee County, *No. 10200.* Identification verified by R. C. Barneby. There is another specimen in the University of Idaho Herbarium collected in the same general locality: on a sandy hill, 3 miles northeast of Grandview, Owyhee County, *J. H. Christ No. 9578.* Apparently a polymorphic species of dry, hot, sandy soils in desert regions. Southeastern Oregon, southwestern Idaho (Owyhee County), Nevada to Colorado and northern New Mexico.

LATHYRUS LATIFOLIUS L. Garden escape, Rathdrum, Kootenai County, *J. H. Christ s. n.*; Sandpoint substation, Bonner County, *J. H. Christ No. 595.* Rapidly becoming naturalized in many sections of northern Idaho.

FRANSERIA DISCOLOR Nutt. A native perennial weed infesting about 40 acres of cultivated, irrigated fields, 1 mile north and 1 mile west of Jerome, Jerome County, *Lambert C. Erickson* (University of Idaho Herbarium No. 26315). Normally distributed from Nebraska to Wyoming, southward to New Mexico and Arizona, but may be expected in cultivated areas. It has a rhizomatous habit which is characteristic of so many of our serious noxious weeds.

HYPOCHOERIS RADICATA L. A common lawn weed in northern Idaho. Specimens have been collected from the campus of the University of Idaho, and there is a sheet in the herbarium from Hope, Bonner County, collected August 12, 1914, in a lawn. In any region in which it is found it becomes an abundant and troublesome lawn weed. Introduced from Europe.

BIBLIOGRAPHY

1. DAVIS, RAY J. Flora of Idaho. William C. Brown Company, Dubuque, Iowa. 1952.
2. HITCHCOCK, C. L., and MAGUIRE, B. A Revision of the North American Species of Silene. Univ. Wash. Publ. Biol. 13:1–73 (1947).
3. ST. JOHN, H. Flora of Southeastern Washington and of Adjacent Idaho. Student Book Corporation. Pullman, Wash. 1937.

ERIOGONUM NOTES V: E. GLANDULOSUM, WITH A NEW VARIETY

BY JOHN THOMAS HOWELL

Eriogonum glandulosum (Nutt.) Nutt. is one of the older species of the genus, having been named and described (as *Oxytheca)* more than one hundred years ago, but because it is one of the rarer species, it has not been well known. In 1906 Rydberg (Fl. Colo. p. 107) confused with *E. glandulosum* the very distinct plant described in 1891 as *E. flexum* by M. E. Jones, a confusion in which all authors dealing with these plants have participated down to the present, excepting only Miss Stokes, who recognized *E. flexum* as a distinct species (Gen. Eriog. p. 25). However, Miss Stokes overemphasized the relationship of *E. glandulosum* to *E. trichopes* Torr. by treating it as a subspecies of that species and further confused her subspecific taxon by making *E. trichopes* var. *rubricaule* (Tidestrom) Stokes a part of it.*

The occasion to examine critically this interesting problem came to me recently when I received from Dr. P. A. Munz a Californian variant of *E. glandulosum* that appeared to be undescribed. The result of this study is given in the following key and synopsis which will evaluate what I believe to be a distinct and remarkable species. To Dr. Munz and curators of herbaria who have loaned me material for this study I am very grateful.

Key

Involucre 3-parted, the divisions extending almost to the base, the involucral peduncle usually bent at a right angle above the middle..... *E. flexum*

Involucre 4- or 5-lobed, the lobes ⅓–½ the length of the involucre, the involucral peduncle straight or flexuous.

Stems and peduncles rarely glandular-hairy; involucre 4-lobed; anthers oblong ..... *E. trichopes*

Stems and peduncles capitate-glandular; involucre 5- (or sometimes 4-) lobed; anthers round ..... *E. glandulosum*

Perianth yellow, becoming reddish-tinged in age; basal and lower cauline leaves hirsutulous but scarcely glandular .... var. *glandulosum*

Perianth pink or whitish with reddish midvein; leaves hirsutulous and slightly glandular ..... var. *carneum*

*In an earlier note I have already discussed the identity and specifitity of *E. rubricaule* Tidestrom (Leafl. West. Bot. 6: 178, 179,—1952).

Synopsis of Eriogonum glandulosum

Eriogonum glandulosum (Nutt.) Nutt. ex Benth. in DC. Prodr. 14: 21 (1856). *Oxytheca glandulosa* Nutt., Journ. Acad. Nat. Sci. Philadelphia, ser. 2, 1: 170 (1848). *E. trichopes* Torr. subsp. *glandulosum* (Nutt.) Stokes, Gen. Eriog. 25 (1936), exclud. var. *rubricaule* (Tidestr.) Stokes.

Annual; stems erect, 0.5–3 dm. tall, branching from base or above and bearing tack-shaped glands, the glands more numerous on lower part of internodes, sparser or lacking on upper part of internodes; foliage leaves basal, broadly elliptic to round, 0.7–2.5 cm. long, 0.5–2 cm. wide, rounded-obtuse (rarely subacute) at apex, rounded to broadly cuneate at base, pilose-hirsutulous above and below, sometimes a little glandular, petiole 0.5–4 cm. long, pilose-hirsutulous; cauline leaves reduced to bracts, broadly deltoid or narrowly ovate, more or less connate, hirsutulous and sometimes glandular below, becoming glabrous above; peduncles slender, spreading or ascending, 3–10 mm. long, bearing tack-shaped glands mostly below the middle; involucres broadly or narrowly turbinate, 1.3–2 mm. long and about as broad, about 5-flowered, glabrous without and within, 5- (or rarely 4-) lobed, the lobes obtuse to subacute, about ⅓ length of involucre, bractlets finely hirsutulous and perhaps a little glandular, pedicels glabrous; perianth yellow or pinkish, about 1 mm. long in anthesis, densely pilose outside with fine spreading hairs, glabrous inside, segments about equal, broadly lanceolate to ovate, in fruit becoming somewhat longer, about 2 mm. long and lanceolate or lanceolate-attenuate; stamens 9, anthers roundish, 1/7–1/5 mm. in diameter; achene smooth and glabrous, about 1.5 mm. long, dull, the sharply triangular beak light brown, the roundish body dark brown.

Eriogonum glandulosum var. glandulosum.

Perianth yellow, becoming reddish-tinged in age; anthers yellow.

Type-collection: Rocky Mountains, *Gambel* (G, from "Coll. Nuttall. presented by Elias Durand, 1866").

Nevada. Lander County (?): Fish Creek, *T. S. Brandegee in 1885* (G, UC). Elko County: dry sandy soil, south end of Pilot Mt., *Holmgren 1594* (UC). Lincoln County: on volcanic ash of foothill mesa, 10 miles east of Groom Dry Lake on road to Crystal Springs, 4000 ft., *Train 2375* (DS, NY).

Utah. Juab or Tooele County: Deep Creek, *Jones,* June, 1891 (UC, US), July 29, 1891 (CAS, G, PO). Millard County: alkaline gravel-clay bank, Preuss Lake south of Garrison, 5250 ft., *Ripley & Barneby 9271* (CAS).

Eriogonum glandulosum var. carneum J. T. Howell, var. nov., perianthiis carneis vel albescentibus costis rubescentibus, antheris rubris, foliis bracteisque paulum glandulosis.

Collections. California: dry sandy wash at west base of Last Chance Mts., east of Eureka Valley sand dunes, 3800 ft., Inyo County, August 23, 1955, *J. C. & A. R. Roos 6527* (CAS, type; RSA); west of summit in canyon above Crystal Spring, Tecopa Pass, Kingston Range, 4100 feet, San Bernardino County, June 21, 1941, *Alexander & Kellogg 2383* (DS, UC).

This plant, scarcely more than a form distinguished by characters of color and, less surely, of vestiture, is recognized varietally because of its occur-

rence on the western periphery of the diffused distribution of the species as a whole. While the California stations are some 150 miles from the nearest Nevada station for the species in Lincoln County, it is interesting to note that the two California stations for the variety are themselves about the same distance apart, to the northwest and southeast of Death Valley National Monument. The Kingston Mt. collection was studied by Miss Stokes in 1941 and was distributed with her determination, "Eriogonum trichopes subsp. glandulosum (Nutt.) Stokes aff."

A NEW CORYDALIS FROM OREGON

BY MORTON E. PECK

Willamette University, Salem, Oregon

Early in September, 1947, the writer received from Mr. Warren C. Wilson of Maplewood, Oregon, a specimen of *Corydalis* which he believed represented an undescribed species, or at least one new to the northwest flora, with which he is fairly well acquainted. I was in agreement with his conclusions. The specimens obtained were too scant for an entirely satisfactory study or diagnosis, and Mr. Wilson volunteered to try for more material as opportunity might offer. Finally in August, 1955, he sent me a generous parcel of fresh material from the same locality where that of the previous sending had been obtained. This made possible a fairly full description. When this was near completion, several fine specimens of the same thing, from a different locality, collected by Mr. and Mrs. Earl Marshall and Mrs. Lilla Leach of Portland, were brought me by Mrs. Leach. This material was taken in the prime of flowering, and at once served to establish this as the most beautiful species of the genus west of the Rocky Mountains. The diagnosis under the joint authorship of those most concerned with this is herewith presented:

Corydalis aquae-gelidae M. E. Peck & W. C. Wilson, spec. nov. Planta aquatilis vel subaquatilis dense vel laxe fasciculata e rhizomatibus profundis stolones saepe bifurcatos dimittentibus; caulibus erectis 3–9 dm. altis simplicibus vel 2–4-ramosis, ad basin parce frondosis summe succosis nonnumquam cavis; foliis basilaribus caulinibusque inferioribus caulibus subaequilongis, petiolis laminis subaequilongis, laminis pinnate plerumque 4-divisis, petiolulis praeter seriem primam brevissimis, segmentis ultimis 8–15 mm. longis, segmentis ultimis foliorum superiorum multo brevioribus

3–7 mm. longis; racemis terminalibus 5–10 cm. longis, floribus ad 30 vel 40, racemis lateralibus nonnumquam multis multo brevioribus, pedicellis 8–12 mm. longis; corolla clare roseo-lavendulacea, petalis 8–10 mm. longis, cucullo petali summi extente carinato margine pellucido, calcare lamina aequilongo; capsula anguste elliptica 7–10 mm. longa, seminibus 2 mm. longis.

Plant aquatic or subaquatic, in large dense or rather loose clusters from deep-seated rootstocks producing often bifurcating stolons; stems erect, 3–9 dm. high, very succulent and more or less fistulose below but slender above, simple or sometimes 2–4-branched from near the base; basal and lower cauline leaves about equaling the stem, the petiole as long as or somewhat shorter than the blade, the latter ovate in general outline, pinnately mostly 4-divided or -parted, the primary and secondary series of segments commonly 8–10, always alternately arranged on the rachis, all segments or all but the primary series very short-stalked or sessile, the ultimate series very numerous and many confluent, mostly narrowly elliptic to elliptic- or linear-oblong, 8–15 mm. long, the ultimate segments of the upper cauline leaves much reduced, 3–7 mm. long; leaf-segments not usually spreading in a single plane, but often diversely, the entire blade having a very compact habit; raceme terminal on the stem or one on each of the few main branches, or sometimes several on short lateral branches, in the latter case the inflorescence occasionally partly paniculate, the main raceme 5–10 cm. long, the flowers usually numerous, up to 40, the bracts lanceolate or linear-oblong, 5–10 mm. long; corolla bright rose-lavender, the petals 10–12 mm. long, the upper petal of the outer pair with prominently keeled hood, the spur about equaling the blade in length and 2 mm. broad at base, the inner petals with claw equaling the main blade; capsule 8–12 mm. long, narrowly elliptic, the style about half as long; seeds 2 mm. long.

Type (in Herb. Willamette Univ., Acq. No. 28829) collected by Warren C. Wilson at the juncture of Clackamas River with Calliwash River, Clackamas County, Oregon, July 30, 1955. The above-mentioned material secured by Mr. and Mrs. Marshall and Mrs. Leach was collected on Squaw Mountain, near Lookout Spring Guard Station, on Aug. 14, 1955, at a point about 13 miles east of the type locality. All the specimens were found growing in water a few inches deep or on mud at the margins of springs and streams, the temperature of the water being apparently always low, not much above freezing point, as reported by Mrs. Leach for the Squaw Mountain material. The specific name selected for the new species seems therefore quite appropriate.

Euphorbia serpens in Cismontane California. On October 23, 1955, Henry M. Pollard collected *Euphorbia serpens* H.B.K. near a lemon-packing plant at Goleta, Santa Barbara County. The only other Californian record for this species that I know of is that of S. B. Parish from the Salton Sink (Carnegie Inst. Wash. Publ. 193: 110,—1914).—J. T. Howell.

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Charles Piper Smith, about 1930

CHARLES PIPER SMITH, 1877–1955

BY JOHN H. THOMAS
Dudley Herbarium, Stanford University

Charles Piper Smith was born in St. Catharines, Ontario, Canada, on April 25, 1877, to Thomas Rea Smith and Lucy Leavenworth Smith, the youngest of five children. His mother was Canadian, having been born in St. Catharines, but his father was born in Schellsburg, Pennsylvania, and thus Charles Piper Smith could claim American citizenship from birth. His early life was spent in Canada, in Portsmouth, Ohio, and in Bedford and Anderson, Indiana. He graduated from high school in Anderson in 1897 and three years later entered Purdue University from which he graduated with the degree of Bachelor of Science in 1903. Although primarily interested in natural history, he was a member of the Irving Literary Society. During the year following his graduation he was employed by the Indiana State Forestry Board. This resulted in one of his first publications, "Report upon a botanical survey of the Indiana State Forest Reservation." From 1904-06 and 1907-08 he was in attendance at Stanford University, studying primarily botany and entomology. He received the degree of Master of Arts in 1908, presenting a thesis on spiders entitled, "Studies in the family Avicularidea and related families," and prepared under the guidance of Professor Vernon Kellogg.

The intervening year, 1906-07, was spent as forester, entomologist, and water-biologist with the Pacific Improvement Co. in Monterey. Following his graduate work at Stanford he was successively assistant professor of zoology and entomology and assistant professor of botany at Utah Agricultural College in Logan from 1908-11. He spent the year of 1911-12 at Ithaca, New York, as a graduate student and teaching assistant in the Department of Plant Pathology at Cornell University.

In August, 1910, Smith married Edyth Gertrude Menker of San Jose, California, and returned with his bride to Logan. From 1912-20 the Smiths lived in Maryland where he was first an as-

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sociate professor of botany at Maryland Agricultural College (1912-14), then seed inspector and analyst with the Maryland Board of Agriculture (1912-19), and finally he was employed by William G. Scarlett & Co., wholesale seedsmen in Baltimore (1919-20). The year 1920 saw the Smiths back in California where they were to make their homes for the rest of their lives. From 1920-40 he taught biology and botany at the San Jose High School. Perhaps his return to California was prompted by family reasons, or perhaps he wished to be nearer to one of the centers of distribution of the genus *Lupinus* in which he had become interested.

By 1926 Smith had published fourteen papers on *Lupinus* and had contributed the treatment of the genus for the then-new Manual of the Flowering Plants of California by W. L. Jepson. In the fall of that year he applied for admission to candidacy for the degree of Doctor of Philosophy at Stanford. His petition was accepted and he was awarded the degree in June of 1927 with a dissertation entitled "The lupines of the Pacific States of North America" prepared under the direction of Professor LeRoy Abrams. A rather curious situation developed in connection with Dr. Smith's dissertation. Stanford University had only recently abandoned the custom of requiring one typewritten and eventually one hundred printed copies of a doctoral dissertation. Since his treatment of the Pacific States lupines was to be used in volume two of Abrams' Illustrated Flora of the Pacific States, Dr. Smith petitioned to be allowed to follow the old dissertations requirements. No one at that time could foresee that it would be 1944 before volume two of the Illustrated Flora would appear. Meanwhile, Dr. Smith had revised his dissertation. The copies of his printed dissertation in the Stanford Library, which were submitted in 1944, thus bear a date of 1927 on the title page but include taxa described in 1940 and new combinations which did not become effective until the publication of the Illustrated Flora. Not only that, but even the title was changed to "A taxonomic study of the Pacific States species of Lupinus"! In spite of (or perhaps because of) the delay, Dr. Smith's treatment of *Lupinus* in the Illustrated Flora is the best and most realistic that exists to date for the Pacific States.

In 1923 a daughter, Rachel Jane, the Smiths' only child, was born. While Dr. Smith was in Europe during the summer of

1930, a trip made possible by a National Research Council grant, he received word at Geneva that his daughter had died suddenly. Dr. Smith was crushed but he determined to continue his research on lupines at various European herbaria. He returned to San Jose in August to an empty house and a heartbroken and ailing wife. In November Mrs. Smith died. Though immeasurably saddened, Dr. Smith nevertheless continued his teaching and his research.

By this time, Dr. Smith had become recognized as an authority in the genus *Lupinus* and many collectors sent their lupines to him for identification. During those years, too, most of his correspondence came addressed to him as "Professor," and he was known by that title at San Jose High School.

Dr. Smith married again in August, 1931. His second wife, a widow and the mother of several children, was Olive Norton Brown. About 1935, Dr. Smith moved to Saratoga and built large and elaborate facilities for raising chickens, a venture in which he was never entirely successful financially. In addition to their home in Saratoga he had another house toward the back of the lot where he kept his collection, books, accumulated records, and notes. It was here where he would in later years withdraw for several days at a time while working on his plants.

Prior to his retirement, Dr. Smith started in 1938 what he considered to be his main work, a series of papers on lupines under the title of Species Lupinorum, published at his own expense and issued in fascicles of sixteen or thirty-two pages, each fascicle being called a "Signature." Species Lupinorum eventually ran to 44 signatures made up of 768 pages and was published in the years from 1938-53. Not only did he write all of it, but he also typed much of it on a variable-space typewriter. The sheets were then reproduced photographically and printed commercially. In Species Lupinorum are described countless new species and varieties of lupines, both from North and South America, many of which will probably be relegated to synonymy. By this time, Dr. Smith had come to treat species not from the standpoint of their total range but from the standpoint of small politico-geographical units, such as counties, provinces, districts, or departments. His failure to consider the variation throughout the total range of a species resulted in the multiplication of taxa.

Another one of Dr. Smith's interests was the study and raising

of ornamental "geraniums," species and hybrids of *Pelargonium*. He started a publication, Geranium Records, which like Species Lupinorum was issued in signatures and at his own expense. Dr. Smith gained some brief and unwanted publicity in November of 1941 when the International News Service put on its wires a story widely printed in papers throughout the country to the effect that he raised geraniums as a hobby, delving "into the lore of the plant, creating new varieties for his collection of more than 600 kinds," and was "now publishing a book on the geranium, its history and culture." A deluge of letters, many of them bordering on the illiterate, poured in upon him. All were carefully and politely answered and in each Dr. Smith disclaimed credit for being an expert. Geranium Records, despite the publicity, died after the fourth signature due to lack of funds.

Dr. Smith's health during his last few years was very poor and for several months at a time he was unable to work. He continued to work at his lupines, however, when he was able, until his death on January 6, 1955.

Throughout his life, Dr. Smith was deeply interested in the natural history aspects of biology. His special interests, aside from botany, were ornithology and entomology and he maintained a large collection of birds' eggs and nests and was an avid observer. He had a large collection of seeds, probably dating to his years as a seed inspector and analyst. He kept voluminous notes and catalogues of the organisms he observed, some of them handwritten, elaborately illustrated, and ornamented. His herbarium at the time of his death was made up almost entirely of lupines, many of them types. After insects had attacked his collection, he kept it in specially made boxes. His herbarium was presented by Mrs. Smith to the Dudley Herbarium of Stanford University and is now in the process of being mounted.

Dr. Smith travelled widely in the United States and collected lupines extensively in many parts of the western states and western Canada. His last trip of any extent was made to southern California in 1954. Dr. Smith was at one time or other a member of the Torrey Botanical Club, the Ornithological Union, the Indiana Academy of Sciences, and the Botanical Society of America. In 1941 he was invited to submit a biography to be included in Who's Who on the Pacific Coast but apparently never felt it necessary to do so. It is perhaps fitting that his name is

commemorated in the combination *Lupinus Pipersmithii* Heller, a plant whose type locality is near Stanford University.

My own connection with Dr. Smith was that of a graduate assistant in the Dudley Herbarium who helped him find the specimens he wanted to examine and who listened to an old gentleman talk about the plants he loved and had worked on for so many years.

Botanical Writings of Charles Piper Smith

1. Report upon a botanical survey of the Indiana State Forest Reservation. Ann. Rep. State Board of Forestry Indiana 3: 73-161 and map (1904).
2. Notes upon some little-known members of the Indiana flora [all published in Proc. Ind. Acad. Sci.]. *1903:* 133-135 (1904); Paper number two. *1904:* 301-303 (1905); Paper number three. *1905:* 155-158 (1906).
3. A rare Centromadia. Muhlenbergia 4: 73 (1908).
4. Notes from northern Utah [all published in Muhlenbergia]. I. 6: 37-39 (1910); II. 6: 61-63 (1910); III. 7: 61-65 (1911); IV. 7: 136-138 (1912).
5. Notes upon some annual lupines of the Micranthus group. Muhlenbergia 6: 133-141 (1911).
6. The fruit of Lupinus Tidestromii Greene. Muhlenbergia 7: 51-52 (1911).
7. Review of A. O. Garrett, "Spring Flora of the Wasatch Region." Muhlenbergia 7: 58-59 (1911).
8. Studies in the genus Erythrocoma Greene — I. Muhlenbergia 8: 1-17 (1912).
9. Plurality of seeds in acorns of Quercus Prinus. Rhodora 16: 41-43 (1914).
10. Carex Tuckermani niagarensis; a neglected sedge. Rhodora 17: 57-59 (1915).
11. Studies in the genus Lupinus [all published in Bull. Torr. Bot. Club]. I. A new species of the subgenus Platycarpos. 44: 405-406 (1917); II. The Microcarpi, exclusive of Lupinus densiflorus. 45: 1-22 (1918); III. Lupinus densiflorus. 45: 167-202 (1918); IV. The Pusilli. 46: 389-410 (1919); V. The Sparsiflori. 47: 487-509 (1920); VI. The Stiversiani, Concinni and Subcarnosi. 48: 219-234 (1921); VII. L. succulentus and L. niveus. 49: 197-206 (1922); VIII. Lupinus nanus. 50: 159-172 (1923); IX. Lupinus bicolor. 50: 373-387 (1923); X. The Micranthi concluded. 51: 91-102 (1924); XI. Some new names and combinations. 51: 303-310 (1924).
12. Pseudotaenidia in Maryland. Rhodora 26: 23-24 (1924).
13. Lupinus *in* Willis Linn Jepson, "A Manual of the Flowering Plants of California." Pages 516-533. Associated Students Store, Berkeley, California. 1925.
14. Reviews of some perennial lupines. I. Calcarati-laxiflori. Amer. Journ. Bot. 13: 521-530 (1926).
15. A distributional catalogue of the lupines of Oregon. Contr. Dudley Herb. 1: 7-55 (1927).

16. Lupinus *in* Harold St. John, "Flora of Southeastern Washington and of Adjacent Idaho" (with Harold St. John). Pages 225-230. Students Book Corporation, Pullman, Washington. 1937.
17. Species Lupinorum. Signatures 1-44. Pages 1-768. Saratoga, California. 1938-1953.
18. Geranium Records. Signatures 1-4. Pages 1-64. Saratoga, California. 1941-1942.
19. Lupinus *in* LeRoy Abrams, "Illustrated Flora of the Pacific States," Vol. II. Pages 483-519. Stanford University Press, Stanford, California. 1944.

Zoological Writings of Charles Piper Smith

1. Bird notes from the Indiana State Forestry Reservation. Proc. Ind. Acad. Sci. *1903:* 129-132 (1904).
2. A preliminary study of the Araneae Theraphosae of California. Ann. Ent. Soc. Amer. 1: 207-236, pl. 8-20 (1908).

Chenopodium nevadense in California. A recent collection of *Chenopodium nevadense* Standley that was made at Antelope Springs, Deep Springs Valley, Inyo County, California, by Peter H. Raven, *No. 7049,* has been annotated by Herbert A. Wahl as the "first collection I have seen outside of Nevada." In his study of the genus *Chenopodium* in North America (Bartonia, No. 27, pp. 1–46, –1954), Dr. Wahl cites the range of *C. nevadense* as "limited to central and western Nevada" (p. 27).—J. T. Howell.

Lyall's Leafy Aster in California. Two California collections of *Aster foliaceus* Lindl. var. *Lyallii* (Gray) Cronquist in the Herbarium of the California Academy of Sciences have been noted by Dr. Arthur Cronquist as constituting a new state record for the variety: damp sunny meadow, north side of White Mt., 5800 ft., Siskiyou Mts., Siskiyou Co., *L. C. Wheeler 3130,* Aug. 14, 1934; Sky High Valley, about 6000 ft., Marble Mts., Siskiyou Co., *J. T. Howell 15134,* Aug. 7, 1939. In his revision of the *A. foliaceus* group (Amer. Midl. Nat. 29: 429–468, –1943), Cronquist gave the distribution of this variety as "mountains of northern Idaho and adjacent parts of Oregon, Washington, Montana, and Canada," and he did not extend it in his recent treatment (Vascular Pl. Pac. NW. 5: 83, –1955).—J. T. Howell.

THE LUPINES COLLECTED BY DAVID DOUGLAS FROM 1825 TO 1827: THEIR TYPE LOCALITIES AND NOMENCLATURE

BY DAVID B. DUNN[1]

The entire set of Douglas' type specimens of the genus *Lupinus* was borrowed from the Lindley Herbarium at Cambridge School of Botany (CGE) by Dr. P. A. Munz and myself in order to clarify the names of earliest described species from western North America, since Dr. Munz was working on the flora of California and I was working on the lupines of Nevada as well as doing monographic work in the genus. Since the type concept was not in use at the time when Douglas and Lindley made the descriptions or when Douglas' specimens were mounted, none had originally been labeled as types. The labels indicating types had been put on the specimens perhaps as much as 100 years after the plant had been described. *Lupinus micranthus* had definitely been mislabeled and there was considerable doubt about some of the others.

In order to attempt to clear up what was and what was not type material, a thorough study was first made of the type descriptions and the specimens. This proved inadequate for several taxa and as a last resort Douglas' Journal[2] was used to obtain as much information as possible. It was found that, while there was a list of species of lupines in the appendix, only two were referred to definite collections, and I have reason to believe one of these is incorrect. Hence, we found that it was not even possible to refer to the location of the collection of a particular species. Thus, the following attempt to match the Douglas type specimens with his collection numbers was undertaken in order to clarify both the type localities and several type specimens, that of *L. ornatus* in particular. The localities arrived at are probably within 75 or 100 miles of the actual type localities.

It is important to note that, contrary to a common notion, Douglas' numbers in his Journal refer to actual herbarium specimens and that the "S" on the 1825 collection records indicates that seeds also were collected. Refer to p. 103, paragraph preceding the numbered collection: "a dry specimen of each is

1. Visiting Botanist, Rancho Santa Ana Botanic Garden, Claremont, California.
2. Journal Kept by David Douglas During his Travels in North America 1823–1827. London. 1914.

also kept." He apparently did not record in his Journal collections of seeds only. Refer to p. 203: "added a good many seeds, — collected the following plants" (the latter are enumerated); and p. 202: "sent seeds and plants"; as well as numerous other points of reference. It should be noted that there was a reference or a collection number for all of the types of species described from the Columbia River Basin from the Douglas collection except for *L. micranthus* and *L. ornatus*. There are two additional specimens, *L. sericeus* and *L. pusillus*, which Douglas identified, and possibly a third, the specimen Douglas referred to as *L. argenteus (L. ornatus?)*.

The illustrations in Lindley's Botanical Register were all made from plants grown in England and involved, necessarily, a growing season there.

I made dissections of the flowers of each of the Douglas specimens and mounted them on plastic-coated slides, and these were then matched with dissections of present-day material.

Collections Made in 1825

Douglas No. 49 (2 seed samples), April, 1825; Journal pp. 109, 118. Both are apparently *L. leucophyllus* (Bot. Reg. t. 1124; illustration made Oct., 1826). Of his second collection, the white-flowered specimen, Douglas said he "doubted not it would prove to be *L. villosus* Pursh," but that does not occur on the west coast. The red-purple color noted for the first would be the color of light blue flowers after fertilization. This is one of the first species described from his Northwest collections. The type sheet has "Mihi" on it, which must be in Douglas' handwriting. The type locality is cited in the type description as "dry plains, vicinity of Fort Vancouver," and the Douglas journal confirms this. On pages 57 and 58 Douglas refers to *L. leucophyllus* near the Great Falls of the Columbia (Celilo). This part of the manuscript was written after Douglas returned to England. The present distribution suggests the latter as the type locality.

Douglas No. 116 (S), April, 1825; Journal p. 113. This collection has to be *L. polyphyllus* (Bot. Reg. t. 1096; drawn in July, 1826) or *L. grandifolius* (supposed to have been collected in California). Again this is one of the first species described from the region and the notes, "leaflets 14 to 17, lanceolate, herbaceous, and racemes 18 inches long" all apply. Type locality, lowland and along the stream banks, vicinity Fort Vancouver.

Douglas No. 117 (S), April 29, 1825; Journal p. 113. This collection was not given a name by Douglas; he said in his notes it was near *L. sericeus* of Pursh, a copy of whose Flora Septentrionalis he must have had with him. He writes: "leaflets 7 to 9, lanceolate, tomentose, — on plains and river banks." Either this specimen or *No. 90* of 1826, p. 178, is the specimen that Agardh picked and named *L. leucopsis*. Both are in the collection and I would pick the latter for *L. leucopsis*. Explanation below under *No. 90*.

Douglas No. 234, May 23, 1825; Journal p. 122. This collection is probably *L. affinis.* Douglas merely notes that it was var. *albus* of what he supposes is *L. nootkatensis.* The type of *L. affinis* (distinguished by Agardh's handwriting) with obovate leaflets does resemble *L. nootkatensis* and Agardh went to great length to separate the two in his description *(L. carnosulus* Greene).

Douglas No. 235 (S), May 23, 1825; Journal p. 122. This collection would be *L. lepidus* (Bot. Reg. t. 1149; drawn Sept., 1827). Douglas noted, "flowers blue and white, leaflets 5 to 7, lanceolate, silky beneath, a small species, spikes 8–14 inches long, only one cauline leaf, on gravelly soil." The characters fit *L. lepidus,* although it may have 1 to 3 cauline leaves. The species was also one of the earliest described in this group. Type locality, near the Grand Rapids.

Douglas No. 262 (S), May 25, 1825; Journal p. 124. This collection would be *L. bicolor* (Bot. Reg. t. 1109; drawn in Aug., 1826). In addition to the note of annual and the reference in the footnote that *No. 262* was referred to in a manuscript as *L. bicolor,* Douglas wrote in the notes "leaflets 5 to 7, villous on both sides," a character which does not apply to *L. micranthus.* Type locality, near the Grand Rapids.

Douglas No. 263 (S), May 25, 1825; Journal p. 124. I would suggest that this is probably *L. rivularis* (Bot. Reg. t. 1595), in spite of the footnote saying *No. 263* is *L. albicaulis* in manuscript, because *L. rivularis* is the only one of the group that might be interpreted in the field as "whole plant glabrous, branching, leaflets 7 to 9, lanceolate, obtuse." This certainly does not apply to the specimen described as *L. albicaulis* (see below). However, either could have been collected by Douglas on his return to the Fort Vancouver area in 1830 prior to arriving in California on Dec. 22, 1830, but I doubt that he did. Type locality (?): note says banks of rivers and dry soil, Grand Rapids. *Lupinus rivularis* is discussed below.

Douglas No. 277 (S), May 31, 1825; Journal p. 125. This appears to be the specimen described as *L. laxiflorus* (Bot. Reg. t. 1140; drawn in Aug. or Sept., 1827). "Leaflets 4 to 7, pubescent, stems purple, flowers purple rose, plant 1–2 ft. tall, gravelly soil near the Grand Rapids." Unfortunately this is apparently also the specimen which Douglas labeled *L. tenellus,* a name which would have remained unpublished had it not been validated by G. Don (Gen. Syst. Dichl. Pl. 2: 367, —1832) and again by Agardh (Syn. Gen. Lup. 26, —1835).

Douglas No. 296 (S), June 20, 1825; Journal p. 130. This would be *L. arbustus* (Bot. Reg. t. 1230; drawn in Aug., 1828). The name, *Lupinus arbustus,* is written in Douglas' or Lindley's handwriting on the type sheet. It is more robust, as Douglas said, than his *No. 297,* with "all parts alike, hairy" (sericeous). The flower color (faint rose color with a tint of yellow) matches the plate. Near the falls of the Columbia.

Douglas No. 297 (S), June 20, 1825; Journal p. 130. Douglas says "perennial, a small plant seldom more than 10 inches to 1 ft. tall, flowers bright purple, in the same location as 296." Any light blue or lavender-blue flower would be bright purple after fertilization. I believe this is the specimen which was later labeled as *L. laxiflorus,* one branch of which is mounted on the same

original sheet with *L. arbustus*. The specimen has been designated by someone as *L. laxiflorus* but the writing does not appear to be the same handwriting as that of Douglas' "Mihi" or that which I have referred to as either Douglas' or Lindley's. It looks more like Agardh's. Agardh drew his description of *L. laxiflorus* from this specimen ("leaflets shorter than the petioles") and it does not agree with the type description of *L. laxiflorus* done by Lindley. (See Leafl. West. Bot. 7: 254, —1955, under *L. arbustus* ssp. *neolaxiflorus.)*

Douglas No. 426 (S), July 19, 1825; Journal pp. 139, 149. *Lupinus littoralis* (Bot. Reg. t. 1198; drawn in Aug., 1828) is unquestionably the species concerned. "Creeping stems, 5 to 7 linear leaflets, silky on both sides, 8 to 12 seeds, generally 10, and along the seashore," could not fit any other species in the region. Type locality, shores near Cape Disappointment.

Collections Made in 1826

Douglas No. 49, May 5, 1826; Journal p. 169. This must be *L. minimus* Dougl. in Hook. Fl. Bor. Am. 1: 163 (1834). No illustration. The type sheet has *L. minimus* in Douglas' or Lindley's handwriting, and the specimen matches the notes on *No. 49:* "5 to 9 leaflets, equally silky on both sides, 1 to 3 cauline leaves, a small plant 10–16 inches, in open woods and on river banks." The type area would be near the junction of the Kettle and Columbia rivers in the northeastern corner of Washington. (See Douglas' table of mileage, p. 255.) He was not able to obtain seed at the time, only a specimen. One of the pieces has a fragment of *Equisetum* in it, suggesting a field collection.

Douglas No. 90, May 29, 30, 1826; Journal p. 178. Douglas' note says "perennial, 7 to 13 leaflets, silky on both sides, flowers beautiful blue"; hence, the assumption by most that this is *L. ornatus*. However, Douglas goes on to say that it "does not appear to differ much from the one found last year so abundant around Fort Vancouver," which does not fit *L. ornatus*. I believe this is Agardh's *L. leucopsis* (a variant of *L. sericeus* with a less pubescent banner). This specimen (labeled *L. leucopsis* in Agardh's handwriting) and *Douglas No. 117* (see above) are the only two that are actually close enough for Douglas' comment to have applied. Furthermore, this specimen has short, stout petioles conforming with *L. sericeus* material I have collected north of Spokane and on into northern Montana, while the 1825 specimen I believe to be *No. 117* has longer slender petioles, a condition more general in the Fort Vancouver area. However, they are both *L. sericeus* and similar specimens could be found in either area. The specimen of *No. 117* was on the sheet designated *L. ornatus* by someone, the reason *L. ornatus* has often been considered a synonym of *L. sericeus*. Asa Gray correctly labeled it as *L. sericeus* and the other half as *L. ornatus*. The specimen designated by Asa Gray as being probably the original *L. ornatus* (probably *No. 151)* has flowers 17 to 19 mm. long. It is entirely different from *L. sericeus* and appears to fit the type description, with exceptions. See below under *No. 151.*

Douglas No. 121, June 10, 1826; Journal p. 186. "A hairy annual, 2-seeded legume, 4–8 inches high, on the open barren plains." The only Douglas

specimen in the collection fitting this is *L. pusillus* ssp. *intermontanus*. He said "this is no doubt *L. pusillus*." Area around Fort Wallawallah.

Douglas No. 126, June 10, 1826; Journal p. 186. This collection was a species in *Cruciferae,* but in the discussion he notes "a lupine that he doubts not is *L. villosus*." This, then, is either his *L. plumosus* or else the two earlier (1825) collections of *No. 49* were split into two taxa. *Lupinus plumosus* was illustrated Aug., 1828. The fact that no number was allocated to the lupine here indicates he did not make a specimen but merely collected seed. However, Miss Alice Eastwood had a photograph of a short branch of *L. plumosus* in the Lindley collection.

Douglas No. 151, June, 1826; Journal p. 192. This specimen was collected on Douglas' 8-day trip into the Blue Mountains in which he crossed the southern branch of the Wallawallah River. He labeled it as "*L. argenteus,* of Pursh, . . . on the subalpine or undulating grounds, in dry gravelly soils. Seldom exceeding 14–18 inches, abundant with the annual species so common on the alluvial plains of the Columbia." The annual would be either *L. bicolor* or *L. pusillus* but I believe he would have said *pusillus* since he had just mentioned it under *No. 121.* The perennial, however, is another problem since none of his specimens was *L. argenteus (L. tenellus* labeled by him, is a variety of *L. argenteus,* but he was not aware of that). It would have been a little early for ripe seed from an alpine habitat; however, he got seed of *No. 152* at some time, and there is a half mature pod. I believe this will prove to be the specimen which Asa Gray labeled as the type of *L. ornatus,* probably a blue-flowered *L. Sabinianus.*

Douglas No. 152, June, 1826; Journal pp. 192, 268. Douglas notes: "leaflets 5 to 10, lanceolate, densely covered with white silky hairs, stem nearly smooth, flowers very large bright golden yellow; . . . found on mountainous grounds." These characters leave no doubt that *L. Sabinianus* (Bot. Reg. t. 1435; flowered first time in May, 1831) and *No. 152* are the same. The type specimen is labeled in Douglas' handwriting and Lindley validated an herbarium name. Type locality, the Blue Mountains? Probably Wallowa Mts.

Douglas No. 180 (bis), June 28, 29, 1826; Journal p. 196. The notes, "5 to 9 lanceolate leaflets, pubescent, 1 foot to 18 inches tall, flowers small, white," leave only *L. sulphureus* (Dougl. in Hook. Fl. Bor. Amer. 1: 166, —1834) as a possibility. He said, "always alone, taken at the foot of the mountains in dry soil." This was on his second trip to the Blue Mts. along the North Fork of the Wallawallah. The color should be yellow, but by the end of June the flowers might well be somewhat bleached and the true color show later on growing it in England. The label of *L. sulphureus* says junction of Lewis and Clark (Snake) and the Columbia. The name *L. sulphureus* is in Douglas' handwriting.

Douglas No. 218, July 31 to Aug. 6, 1826; Journal p. 205. The specimen was collected on the trip overland by horse from the junction of Snake and Clearwater rivers to Spokane and Kettle Falls. His notes, "perennial hirsute, flowers blue, in small patches on the plains, rare," could only apply to the specimen labeled as the type of *L. aridus* which is today present in the same area. The type specimen has an annotation which is typewritten saying *Douglas No. 97,* 1827. That number is unfortunately not in Douglas' Journal. Illustration drawn in the fall of 1828.

Journal, p. 228, Oct. 23, 1826. Douglas records his observation on a shrubby species of lupine with "5 to 7 or 9 leaflets, lanceolate, silky on both sides, 2–4 feet tall," but apparently he did not make a specimen since he "could find none in a perfect state." However, he undoubtedly collected seed since his account of the trip frequently refers to his seed collection. This would also account for the absence of a Douglas specimen in the Lindley collection. This is the only reference to a lupine that could fit *L. albicaulis* which was described from material from the Northwest. Besides Douglas explored the Umpqua River Valley in October, 1826, on his 593-mile trip to the south of Fort Vancouver and that region is in the present-day known range of *L. albicaulis*. It is therefore suggested that the Umpqua River Valley is the type locality. The type specimen at Kew (photographed by A. Eastwood) is apparently from a garden plant.

Remarks on Three Species

1. Lupinus micranthus Dougl. in Lindl., Bot. Reg. t. 1251 (July, 1829).

Douglas found this species on the southern tributaries of the Columbia, undoubtedly on one of his two trips up the Multnomah (Willamette) River, since the hairy form illustrated is today found in that river valley near Corvallis, Oregon. It should be noted that Lindley's reference to the interior of California was erroneous since the Umpqua River Valley is as far south as Douglas traveled from 1825 to 1827. Douglas then returned to England and did not reach California until Dec. 22, 1830. *Lupinus micranthus* was described prior to that date, probably from seed sent to England, since no specimen was listed in his Journal. In his discussion of his trip to the Umpqua, however, Douglas said he had papers along and refers to making specimens but none from that trip is enumerated in the Journal. A specimen is in the Lindley collection labeled "California Douglas" prior to dividing the sheet. The illustration in the Botanical Register was drawn in the Horticultural Society Gardens, May to July, 1828.

2. Lupinus ornatus Dougl. in Lindl., Bot. Reg. t. 1216 (Feb. 1, 1829). *L. Hellerae* Heller, Bull. Torr. Bot. Club 25: 265 (1898); type collected 4 miles east of Lewiston, opposite Central Ferry, along the Clearwater River, Nez Perce Co., Idaho, *A. A. Heller 3080* (type collection, DS).

The illustration of *L. ornatus* was made from a garden specimen raised in 1827. The inflorescence could fit either the specimen that Asa Gray designated as probably *L. ornatus* or *L.*

Hellerae, but the other characters fit the latter much better. Douglas spent a week at the junction of the Snake and Clearwater rivers (he referred to it as the junction 150 miles up the Lewis and Clark River, eastward from Fort Wallawallah) which is the type locality of *L. Hellerae.* On page 202, Douglas said he sent seeds and plants back to Fort Vancouver with Mr. McDonald, while he and Mr. Work went overland to Kettle Falls *via* Spokane. He did not write up the seed collections in the Journal and he only tried to collect specimens that were in their prime. At the time that he was at the Clearwater-Snake River junction the lupines would have been past their prime and in fruit. I believe that the description of *L. ornatus* was made from the gardens plants grown from seed that Douglas sent from the vicinity of the Clearwater-Snake River junction area rather than from the specimen labeled as *L. ornatus* by Asa Gray (see discussion of *No. 151* of 1826 above). That plant has petioles about the same length as the leaflets while the illustration of *L. ornatus* shows the petioles cut off, indicating that they were too long to be included in the illustration. The entire petiole was always included in the illustrations wherever possible (compare *L. Sabinianus,* Bot. Reg. t. 1435, with *L. ornatus,* Bot. Reg. t. 1216).

There are several additional characters which tend to confirm that *L. Hellerae* is *L. ornatus.* Leaflets in the latter numbered 7 to 12, were linear-lanceolate, and densely silky on both sides. These characters apply to *L. Hellerae* and the petioles of *L. Hellerae* are 8–10 cm. long. *Lupinus ornatus* has small white seeds, according to Douglas, a fact which also suggests narrow pods. Two specimens of *L. Hellerae* show the small white seeds: 1) *St. John, et al. 3246* (DS 372202), collected on a sandbar, 5 miles east of Lewiston, Idaho, along the Clearwater River, and 2) *St. John, Warren, & Cary,* May 30, 1924, collected on a gravel bar north of Lewiston along the Clearwater River (DS 372203). In these specimens the seeds are 2.8–2.9 mm. wide and 3.5–3.8 mm. long and the pods are 5.5–6.3 mm. wide. All of these measurements are smaller than those for any of the other taxa of the area that might be interpreted as *L. ornatus.* These specimens were collected not far from the place where Douglas camped.

A specimen in C. P. Smith's herbarium was given to him by Dr. Richter of the Biologische Reichsanstalt of Berlin-Dahlem, Germany, in 1936, as material of *L. ornatus* cultivated in Eu-

rope. This specimen has 6 or 7 leaflets which are nearly glabrous on the upper surface while the pods are 8.9 mm. wide and the seeds are 5.3 mm. long and 4 mm. wide. None of these characters fits the type description, so we conclude that 100 years of garden culture had resulted in hybridization at least, if the specimen had *L. ornatus* in its lineage at all.

3. Lupinus rivularis Dougl. in Lindl., Bot. Reg. t. 1595. *L. lignipes* Heller, Muhl. 8: 66 (1912).

Alice Eastwood, C. P. Smith, and W. L. Jepson were in Europe and studied the type of *L. rivularis* and each came back and applied the name to a different taxon along the west coast. I concur with Jepson's note on the herbarium sheet he chose as the type. He selected the garden specimen with the Herb. Soc. Hort. Lond. label (America boreali-occidentalis, Douglas, 1830) and suggested that the second sheet was probably the wild specimen. He also pointed out that Lindley was in error in saying "from California" in the type description since the term "boreali-occidentalis" was employed for collections from the Northwest, the Columbia River Basin. Jepson also noted that the flowers, foliage, and inflorescence were strikingly like the illustration. However, he then returned and misapplied the name to *L. latifolius*. I agree with C. P. Smith's use of the name as applied in his treatment in Abrams' Flora of the Pacific States.

The characters which mark the specimen as *L. rivularis* are: (1) the leaflets as long as the petioles, (2) the oblong-oblanceolate shape, (3) the ciliation along the entire length of the upper edge of the keel (longer at the acumen, the reverse of the artist's conception), (4) Lindley's statement about a loose but not straggly mode of growth, and (5) the statement about sparse pubescence below on the leaflets implying glabrousness above. To the naked eye, the plant appears glabrous.

To fix the locality somewhat better, refer above to *No. 263* of 1825, Douglas Journal p. 124. The notes can only fit *L. rivularis*. Moreover, *L. lignipes* Heller (type locality, Eugene, Oregon, on the Willamette) is a synonym, essentially identical in every respect except in nature the stems appear decumbent, branching (as also in Douglas' wild specimen). In 1825 Douglas made a trip of 133 miles up the Multnomah River (now the Willamette) and approached the type area of *L. lignipes*.

A NEW SPECIES OF ARENARIA

BY BASSETT MAGUIRE
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AND
R. C. BARNEBY
Wappingers Falls, New York

Arenaria Rosei, herein described, is a member of the *A. stricta* Mx.—*A. Nuttallii* Pax complex in western North America. Close relationship among the geographically restricted *A. Rosei* and its two more polymorphic and geographically extended congeners is at once obvious because of concord of "critical" characters and over-all morphological organization, *i. e.* the *facies* of the entire ensemble. Common to the three are similar habit, conspicuous "fasciculation" of the secondary leaves, fragile inflorescence, and stout caudex and taproot (except in one subspecies of *A. stricta).*

Arenaria Nuttallii and *A. Rosei* are most readily distinguished from *A. stricta* (sens. lat.) by their massive oblong seeds, which in the latter are reniform (hence broader than long) and much smaller. Fasciculation of the secondary leaves is less prominent than in *A. stricta.*

Arenaria Nuttallii and *A. Rosei* are thus obviously between themselves more closely interrelated. The subspecies of the first are held together by continuity of form in which morphologically minor differentiation is accompanied by geographic segregation. In *A. Rosei* morphologic differentiation has progressed along three distinct lines: 1. Herbage is glabrous and glaucous; only in the upper part of the inflorescence is to be found the diminished presence of the characteristic stipitate glandulosity so prevalent in the various subspecies of *A. Nuttallii.* 2. The conspicuous diffuse inflorescence of *A. Rosei* is much longer than the leafy portion of the stem; whereas in the subspecies of *A. Nuttallii* the leafy portion of the stem is ordinarily considerably longer than the inflorescence. 3. Reduction in the number of ovules to six is concurrent with a compensating enlargement of the single maturing seed; in *A. Nuttallii* the ovules vary from nine to fifteen; two or three, or sometimes a single seed, develop and are at maturity some twenty to thirty per cent smaller than those of *A. Rosei.*

Two obvious courses are open for the taxonomic disposition of *A. Rosei.* One may more loosely, but with some justification, consider the element to form a subspecific taxon of *A. Nuttallii.* To do so one would be forced to recognize for it a more progressive differentiation than obtains among the others, so that the entity would thus stand alone above the other subspecies of *A. Nuttallii.*[1] The second course, and the one accepted by the writers, is to consider *A. Rosei,* which appears morphologically always to be clearly distinct, to have evolved and differentiated sufficiently from its closer relatives to have achieved specific status.

The new species may be separated from *A. Nuttallii* in the following manner:

Primary leaves 5–10 mm. long, 3-nerved, non-glaucous, stipitate-glandular (rarely glabrous); inflorescence half or less than half the length of the glandular stem; sepals 3.5–6.5 mm. long, lanceolate, acuminate or pungently attenuate, 1–3-nerved, usually moderately or strongly glandular; ovules 9–15; seeds several or solitary, oblong, 1–1.3 mm. broad, 1.25–2 mm. long ..... *A. Nuttallii* Pax[2]

Primary leaves 4–12 mm. long, 1-nerved, glaucous, glabrous; inflorescence diffuse, exceeding the length of the glabrous stem; sepals 3.0–4.5 mm. long, narrowly ovate or broadly lanceolate, merely acute, sparingly glandular, 1-nerved; ovules 6 (7); seed solitary, oblong, 1.4–1.5 mm. broad, 2.3–2.8 mm. long ..... *A. Rosei* Maguire & Barneby

Arenaria (sect. ALSINE Benth. & Hook.) **Rosei** Maguire & Barneby, spec. nov., *A. Nuttallii* Pax affinis sed differt inflorescentiis longioribus magis diffusis, floribus minoribus et seminibus multo longioribus.

Herbae perennes graciles e radice verticali inferne glabrae inflorescentia parce stipitato-glandulosae; caules annotini e caudicis suffruticulosi in glareis sepulti ramulis oblique adscendentibus emissi 12–24 cm. longi, basi pauciramosi deinde simplices, per dimidiam tertiamve partem foliosi, in cymam laxe paniculatam effusam abeuntes; folia subulato-linearia acuta vix rigida crassiuscula glauca, majora 4–12 mm. longa, fasciculos foliorum breviorum fere semper suffulcrantia, superiora in bracteas parvas gradatim diminuta; pedicelli filiformes adscendentes fructiferi plerumque divaricati, longiores saltem 16 mm. longissimi ad 29 mm. usque longi; calycis 3–4.5 mm. longi sepala anguste ovata vel late lanceolata scarioso-marginata acuta 1-nervia; petala alba oblanceolata vel anguste oblongo-elliptica obtusa vel subemargi-

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[1] For a discussion of the subspecific organization of *A. Nuttallii,* see: Maguire, Bassett. Studies in the Caryophyllaceae — II. *Arenaria Nuttallii* and *Arenaria filiorum,* section *Alsine.* Madroño 8: 258–262 (1946).

[2] In the Key to the [North American] Species of *Arenaria* (Maguire, Bassett. Arenaria in America north of Mexico, a conspectus. Am. Mid. Nat. 46: 494–498, —1951), *A. Rosei* would be placed last, following: "41. *A. nuttallii*" (p. 498). In the "Key," substitution should be made for line 2, page 498, so as to read: "10 mm. long, 3-nerved; seed oblong, 1.0–1.3 mm. broad, 1.25–2.0 mm. long, brown . . .".

nato-truncata 4.5–6.3 mm. longa, sepalis duplo vel sesquilongiora; glandulae adversus sepalis modice evolutae; staminum filamenta 1.4–4 mm. longa; styli 3, 0.9–1.6 mm. longi; ovula 6, rarius 7, unum solum in semen maturescens; capsula ovoideo-ellipsoidea 3.5–4.3 mm. longa, calyce parum longior vel brevior; semen oblongo-ellipsoideum 2.3–2.8 mm. longum, 1.4–1.5 mm. latum, de latere paulo supra basin placentae affixum, testa fuliginosa-grisea tenuiter papilloso-tessellata.

Type. Serpentine slopes, at 2500 feet altitude, Peanut, Trinity County, California, June 13, 1955, *J. T. Howell 30370* (holotype, NY; isotypes: CAS, DS, GH, K, RSA, UC, US, WTU).

Paratypes. Hills south and southwest of Peanut, Trinity County, California: May 18, 1954, *R. C. Barneby 11557* (CAS, NY); July 17, 1955, *L. S. Rose 55126* (CAS, F, NY) and *J. T. Howell 30702* (CAS, DS, MICH, MIN, NY, P, RSA, UC, UTC).

Distribution. Known only from loose serpentine gravels, with scattered yellow pine, *Asclepias Solanoana, Senecio Greenei, Allium falcifolium,* and *Astragalus Whitneyi* var. *siskiyouensis,* elevation 2500-2600 feet, hills south and southwest of Peanut, Coast Ranges, Trinity County, California.

THE FIELD OCCURRENCE OF HOWELLIELLA

BY ERNEST C. TWISSELMANN
Cholame, California

One of California's truly rare plants, the Howell snapless snapdragon (*Howelliella ovata* Rothmaler), was first collected by Alice Eastwood near Painted Rock in 1902. It was not again collected until 1948 when it was found by Eben McMillan at the head of Bitterwater Creek in the Pinole Hills. Largely because of his efforts, it has been collected and observed since at several sites. Its range, which rather closely follows the San Andreas Fault, has now been established from the southern Carrisa Plains and Caliente Peak in southeastern San Luis Obispo County to Cedar Canyon in Kern County and to Priest Valley in southern Monterey County. It grows at widely scattered stations and the colonies rarely have more than a few plants.

The abundance and even the occurrence of the plant varies greatly from year to year, its growth seemingly dependent on highly specialized meteorologic conditions. In 1952, a year with heavy rains and a moist warm spring, the plant was found at eleven different stations known to the author. In 1955, the author found one plant, and in 1956, a year with a cold dry spring, no plants at all were found.

The plant grows in a surprising variety of habitats. Typical stations are: on the Pinole Hills, where it grows in barren black clay; at the Twisselmann Ranch in a vernal pool bed where it was found under a dense growth of wild lettuce in heavy adobe soil; in the gypsum sink at the gypsum mine southeast of Simmler; in alkali soil and in black clay in the Cholame Valley; among oaks in gravelly soil in Priest Valley (acc. Munz); in growing grain in adobe soil on hilltops at the summit of Palo Prieta Canyon; in light gypsum soil at Davidson Hills above Grant's Lake; and in fractured brown shale in the Cedar Canyon creek bed. (An excerpt from the flora of the Temblor area, Ms.)

A NUMERICAL SUMMARY OF THE VASCULAR PLANTS OF CALIFORNIA

BY LILLIAN HERRIOTT AND ANITA M. NOLDEKE

The present summary of all plant groups treated in Jepson's Manual of the Flowering Plants of California* was undertaken at the suggestion of Mr. John Thomas Howell who came to realize how useful such a summary would be while he was preparing "A tabulation of California endemics" (Leafl. West. Bot. 7: 257–264). Since Jepson enumerates only the number of species treated in the Manual (p. 11), there has been no way to compare the California flora with floras found in other parts of the United States or elsewhere when more detailed analyses are given. Also in the future it will be of interest to compare Jepson's treatment of our flora with treatments that will be prepared by other botanists.

In the present summary, only categories entirely accepted and treated in keys have been counted; such a genus as *Eichornia* (p. 195) and such a species as *Eriogonum panduratum* (p. 308) have not been counted. Nevertheless, there is a small discrepancy between the species count given here and that given by Jepson: whereas Jepson (p. 11) gives 4019 species (3727 native and 292 introduced, these figures presumably including the additions found in the Supplement on p. 1170), the present count shows that the Manual actually "accepts" 4038 species (3740 native

*A Manual of the Flowering Plants of California by Willis Linn Jepson. Pages 1–1238; figures 1–1023. University of California Press, Berkeley and Los Angeles, California.

and 298 introduced). In treating those species represented in California only by one or more varieties, the first variety has been counted as a species and additional varieties (if there are any) have been counted as varieties. Thus in the summary, the sum of species numbers and variety numbers gives the Manual's total of named vascular plants in California, *viz.*, 5349.

Since the authors prepared their counts independently and then compared their totals, it is believed the figures are quite accurate. The detailed work sheets from which the totals are derived are on file in the California Academy of Sciences.

	Families		Genera		Species		Varieties	
	Native	Introduced	Native	Introduced	Native	Introduced	Native	Introduced
PTERIDOPHYTA	8	...	26	...	79	...	22	...
GYMNOSPERMAE	5	...	14	...	47	...	8	...
MONOCOTYLEDONEAE	17	...	131	22	711	68	98	7
DICOTYLEDONEAE	110	2*	649	85	2903	230	1158	18
TOTALS	140	2	820	107	3740	298	1286	25

*These two families are *Tamaricaceae* and *Dipsacaceae*

THE NUMERICAL SUMMARY OF CALIFORNIA PLANTS AND ENDEMISM

BY JOHN THOMAS HOWELL

With figures available from the numerical analysis of Jepson's Manual by Mrs. Herriott and Miss Noldeke (see above), it is now possible to compare the number of indigenous taxa in California with the number of endemics, a matter of considerable phytogeographic interest since endemism is one of the distinguishing marks of the California flora. The comparison of the numbers of genera and species is simple: the number of "strictly restricted endemic genera" is based on my corrected total (Leafl. West. Bot. 7: 290)[1] and the number of species is from my enumeration of California endemics (ibid., p. 264).

The figures available for indigenous and endemic varieties, however, cannot be compared without adjusting them. As Mrs. Herriott and Miss Noldeke point out, they have counted as

[1] Two more genera which I believed to be restricted to California are now known to occur in northern Baja California: *Tropidocarpum* (cf. Abrams, Illus. Fl. 2: 285, —1944), and *Venegasia* (cf. Rydberg, N. Amer. Fl. 34: 5, —1914; Blake, Contrib. U. S. Nat. Herb. 23: 1599, —1926).

species those species represented in the state only by one or more varieties *(i. e.,* with typical variety not Californian). There are 135 such species in Jepson's Manual. Moreover, when I prepared my enumeration of California endemics, I counted as endemic varieties the typical element of those species in which that element was endemic but in which a subsequent variety was not endemic. There are 42 such "typical varieties" in Jepson's Manual. Hence, in order to compare numbers of named indigenous and endemic varieties, it is necessary to adjust the available figures as follows: 135 must be added to the number of named varieties in the Herriott-Noldeke summary and 42 must be subtracted from my total of endemic varieties. The resulting figures are given below and contrast the indigenous and endemic *named* varieties in Jepson's Manual.

	Genera	Species	Named Varieties
Indigenous	820	3740	1421
Endemic	24	1440	1118
Percentage	2.92	38.50	78.67

APONOGETON DISTACHYUS IN SAN MATEO COUNTY, CALIFORNIA. *Aponogeton distachyus* L. f. *(Aponogetonaceae),* called Cape pond-weed, has been found to grow, apparently spontaneously, in a little pond on the east side of Skyline Boulevard (State Highway 5) immediately south of the junction of Chinese Cemetery Road, 4.6 miles south of the southern boundary of San Francisco. When the plant was first collected on February 11, 1954, it was in flower. The following year it was collected in flower and fruit on April 2. On March 13, 1956, it was observed in flowering condition. Thus the plant seems to be established in this pond.

A native of the region of Cape of Good Hope, *A. distachyus* is sometimes cultivated in our region as an ornamental plant. However, in the above-mentioned pond it seems to grow spontaneously, since the surrounding area is not under cultivation, and it should thus be considered a garden escape. The specimens *(Rubtzoff 1451, 1767)* are in the Herbarium of the California Academy of Sciences.—PETER RUBTZOFF.

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ARIZONA PLANT RECORDS III

BY THOMAS H. KEARNEY†

Two earlier papers (Leafl. West. Bot. 7: 1–11 and 165–175) recorded the addition of certain genera and species to the known flora of Arizona, together with extensions of ranges within the state, additional records of rare taxa, and changes of taxonomic status suggested by recent publications of other authors. A third installment of similar information is presented here, without repetition of data given in the earlier papers. Extensions of the altitudinal range of very many species have also been recorded, but limitation of space precludes presentation of these data in this paper. The page references, in parentheses, are to Arizona Flora by Kearney and Peebles, published in 1951.

Five genera, 22 species, and one variety are here added to the recorded flora of the state, bringing the total number of additions reported in the three papers to 12 genera and 53 species.

Additional Taxa

Aegilops cylindrica Host. Grand Canyon Village, Coconino Co. *(Whiting in 1941)*, Prescott, Yavapai Co. *(Passey in 1955)*, Pinetop, Navajo Co. *(Michaels in 1955)*. This weedy European grass, commonly known as Goat Grass, is more or less naturalized in many parts of the United States and tends to become a troublesome weed in fields and pastures. The genus, as well as the species, was not previously recorded for Arizona. *Aegilops* is nearly related to *Triticum*, the genus that includes the cultivated wheats. In the key to the genera of *Gramineae* in Arizona Flora, it would be inserted under second paragraph 32 (p. 73), differing from *Secale* in its terete, much narrower spikes, etc.

Muhlenbergia tenuifolia (H.B.K.) Trin. Dragoon Mts., Cochise Co., on a partly timbered slope *(L. N. Goodding 44-54)*. Southern Arizona and Mexico.

This collection was identified by Charlotte Goodding. In the key to the species of *Muhlenbergia* this species would seem to come next to *M. polycaulis* (No. 35, paragraph 44 of the key, pp. 108, 111) but the panicle is more open and the floret is more

†This paper was in press at the time of Dr. Kearney's death on Oct. 19.—J.T.H.

Leaflets of Western Botany, Vol. VIII, pp. 61–80, November 28, 1956.

densely pubescent at base. The flexuous awn of the lemma is about 15 mm. long.

DIGITARIA ISCHAEMUM (Schreb.) Schreb. ex Muhl. Tucson, Pima Co., a common weed in Bermuda-grass lawns, forming patches 20 to 30 feet in diameter *(K. F. Parker 8427)*. Extensively naturalized in the United States, from Eurasia.

This taxon is distinguished from *D. sanguinalis* (p. 132) by the glabrous sheaths and smaller spikelets (about 2 mm. long as compared with 3 mm. in *D. sanguinalis)*.

ANDROPOGON WRIGHTII Hack. This makes the fourth species of Sect. *Amphilophis* of *Andropogon* in the Arizona flora, having been collected in the Canelo Hills, Santa Cruz Co. *(Reynolds in 1954, R. White 153)*, 5000 feet. The species was known previously only from southern New Mexico and northern Mexico. Reynolds' specimen was identified by Charles T. Mason, Jr., and the identification was confirmed by Jason R. Swallen. This species differs from *A. barbinodis* and *A. saccharoides* (Arizona Flora p. 142) and resembles *A. Ischaemum* L. (see Leafl. West. Bot. 7: 166) in having the pedicellate spikelet about as large as the sessile one and the inflorescence not conspicuously silvery-hairy. *Andropogon Wrightii* differs from *A. Ischaemum* in the greenish or tawny inflorescence and the thicker, very obtuse, shiny first glume of the sessile spikelet, which is glabrous except for the upwardly setulose keel, whereas in *A. Ischaemum* the inflorescence is brown-purple and the first glume is acutish or obtusish, not shiny, and appressed-pilose on the lower ⅓ to ½ of the back. (See Eduard Hackel, Andropogoneae, in A. & C. DeCandolle, Monogr. Phan. 6: 474-478.)

JUNCUS ACUMINATUS (No. 17, p. 172). Forma *sphaerocephalus* Hermann (Leafl. West. Bot. 8: 12, 13), characterized by globose, many-flowered heads, has been collected in the Chiricahua Mts., Cochise Co. *(Lemmon 309)*.

LUPINUS VOLUTANS Greene. Between Frazier Well and Hualpai Hilltop, Coconino Co. *(J. T. Howell 26610)*. This is the species mentioned in the paragraph in small type in Arizona Flora (p. 420). It resembles *L. huachucanus* of extreme southern Arizona in its subacaulescent habit, but differs in the longer hairs of the stems and petioles (up to 3 mm. long), racemes scarcely surpassing the foliage, and larger corollas (12–13 mm. long).

LUPINUS CAUDATUS Kellogg. Kaibab Plateau near Jacobs Lake, Coconino Co. *(Eastwood & Howell 1112, 6390, 6432, 6440)*.

These collections were referred formerly to *L. argenteus* Pursh, but differ in having the herbage, even the upper leaf-surface, densely sericeous and the calyx shortly spurred.

ASTRAGALUS. The addition of *A. coccineus* Brandeg. to the known flora of Arizona was reported in an earlier paper (Leafl. West. Bot. 7: 2). Mr. Rupert C. Barneby recently brought to my attention the occurrence of five other species and one variety of this genus not hitherto recorded as components of the state flora. These are:

ASTRAGALUS HALLII Gray *(Pisophaca Hallii* Rydb.). Near Richville, Apache Co. *(Richey in 1950),* previously reported as *A. albulus* Woot. & Standl. (Leafl. West. Bot. 7: 10). Mr. Barneby thought that the Arizona specimen may have been introduced from Colorado or New Mexico, the only states where this species had hitherto been known.

Of the species previously recorded from Arizona, this is nearest *A. famelicus* Sheldon (Arizona Flora No. 29, p. 462) but is readily distinguished therefrom by its dense inflorescences and much narrower, elliptic-oblong, nearly symmetric pods.

ASTRAGALUS GRACILENTUS Gray *(A. Greenei* Gray, *Pisophaca gracilenta* Rydb., *P. Greenei* Rydb.). Natanes Plateau, 34 miles northeast of Globe, Gila Co., 5700 feet, in clay soil in juniper-grassland *(Barneby 12629);* 14 miles northeast of Globe, Gila Co., 4450 feet, dry gravelly hills *(Barneby 12634);* near Salt River Bridge, Gila Co., 4400 feet, sandy talus and rocky hillsides *(Barneby 12625).* New Mexico and central Arizona.

This species, also, is related to *A. famelicus,* differing in its smaller flowers, the corolla being 10–12 mm. long (commonly about 15 mm. long in *A. famelicus)* and lighter colored, whitish or pale purple. The pods are elliptic in outline, narrower and less asymmetric than in *A. famelicus.* As in the latter species, the upper leaf-surface varies from strigose-pubescent to glabrous or nearly so.

Mr. Barneby (personal communication, August 3, 1955), doubted that this taxon is distinct, as a species, from *A. flexuosus* Dougl.

ASTRAGALUS FLEXUOSUS Dougl. Second Mesa, Hopi Indian Reservation, Navajo Co. *(C. C. Michaels 10 in 1955).* Manitoba to Alberta, south to Kansas, New Mexico, and eastern Arizona.

The Arizona collection belongs to var. *Diehlii* (Jones) Barneby, which differs from *A. gracilentus* chiefly in having the

flowers smaller in all their parts. This variety occurs also in western Colorado and eastern Utah.

ASTRAGALUS STRATURENSIS Jones *(Atelophragma straturense* Rydb., *Tium atratiforme* Rydb.). Nixon Springs, Mt. Trumbull, northern Mohave Co., 6500 feet *(Gould 1716).* Southern Utah and Nevada and northwestern Arizona.

Of the species in Arizona Flora, *A. Rusbyi* (No. 52) and *A. recurvus* (No. 54, p. 465) appear to be the nearest relatives of *A. straturensis.* Mr. Barneby (personal communication) pointed out that *A. Rusbyi* differs from *A. straturensis* in the connation of the lowest stipules, much more elongate wing-petals, and much longer-stipitate pods. In *A. recurvus* the pods are sessile or subsessile in the calyx and are strongly curved, whereas in *A. straturensis* they are distinctly stipitate and straight or nearly so. Mr. Barneby has suggested also that the inclusion of "Mount Trumbull (Mohave County)" in the range of *A. Rusbyi,* as stated in Arizona Flora (p. 465), probably was based upon this Gould collection, now referred to *A. straturensis,* and should be deleted.

ASTRAGALUS SCOPULORUM Porter *(Tium scopulorum* Rydb.). Sixteen miles northeast of Salt River Bridge, Gila Co., 5400 feet, on red clay hills with juniper *(Barneby 12620);* Carrizo Creek, 22 miles southwest of Showlow, southern Navajo Co., 4800 feet, clay banks in pinyon-juniper forest *(Barneby 12618);* Black Mesa, Apache Co., 7250 feet *(Deaver 3928).* This species occurs also in Colorado, southeastern Utah, and northern New Mexico.

Astragalus scopulorum has almost completely 2-celled pods. Of the species recorded in Arizona Flora, it seems nearest related to *A. Rusbyi* Greene, *A. Egglestonii* (Rydb.) Kearney & Peebles, and *A. recurvus* Greene (Nos. 52, 53, and 54, p. 465). All of these have pendulous, septate (incompletely 2-celled) pods but looser racemes and much smaller flowers than in *A. scopulorum.* The corollas are not more than 8 mm. long, whereas in *A. scopulorum,* the ochroleucous corollas are nearly 20 mm. long. Rydberg (N. Amer. Flora 24 (5): 380) referred *A. Rusbyi* to his segregate genus *Atelophragma,* but included *A. recurvus* and *A. Egglestonii* in *Tium* (ibid. pp. 396, 397). These three species seem, however, to be more closely interrelated than Rydberg's treatment would indicate.

ASTRAGALUS HUMISTRATUS Gray var. HUMIVAGANS (Rydb.)

Barneby *(Batidophaca humivagans* Rydb.). In Arizona Flora (p. 461) this taxon was synonymized with var. *sonorae* (Gray) Jones, but R. C. Barneby (Amer. Midland Nat. 55: 478, 1956) has pointed out several characters in which these varieties differ and has noted that, in Arizona, var. *humivagans* is found only north of the Gila River, whereas var. *sonorae* is limited to the southern counties.

Another species is added to the known flora of Arizona by the replacement of *Astragalus convallarius* Greene by two varieties, raised to specific rank. (See below under Changes of Taxonomic Status.)

NAMA ROTHROCKII Gray. Near Mt. Trumbull, northern Mohave Co., about 6000 feet *(Jaeger in 1941).* Known previously only from California. Readily distinguishable from all species of *Nama* recorded previously for this state (Arizona Flora, pp. 705, 706) as a perennial, with thickish, coarsely serrate-dentate leaves and densely subcapitate, many-flowered, terminal inflorescences.

TRICHOSTEMA MICRANTHUM Gray. This species, known previously only from southern California and northern Baja California, has been collected near Mt. Trumbull, northern Mohave Co., about 6000 feet *(Jaeger in 1941).* It resembles *T. brachiatum* (Arizona Flora p. 734) in being annual, but the corolla-tube is curved upward (not straight as in *T. brachiatum),* the leaves are commonly narrower (2–6 mm. wide as compared with 4–16 mm. in *T. brachiatum),* and the flowers are more numerous in the cymules.

SALPICHROA RHOMBOIDEA (Gill. & Hook.) Miers. Tucson, Pima Co., a common weed in yards *(K. F. Parker 8426).* Cultivated and tending to become naturalized in California and southern Arizona; native of southern South America.

Lily-of-the-valley vine. In the key to the genera of *Solanaceae* (p. 749), *Salpichroa* would come nearest to *Capsicum,* differing in the deeply cleft calyx, urceolate corolla, and non-pungent fruit. The shape of the whitish corolla is much as in *Margaranthus,* but the species of the latter are small annual herbs with a greatly accrescent calyx, whereas *Salpichroa* is a subshrub with long, flexuous stems and a non-accrescent calyx.

ENGELMANNIA PINNATIFIDA Nutt. (p. 891). Window Rock, northern Apache Co., 6850 feet *(C. F. Deaver 4836).* This seems to be the first definite record of occurrence of this interesting

member of the *Compositae* in Arizona, although Gray (Syn. Fl. N. Amer. 1 (2): 244) included that state in the range.

COTULA AUSTRALIS Hook. f. Papago Park near Tempe, Maricopa Co., in sandy-silt soil, April *(E. R. Blakley 1981)*. Probably an introduction from southern California, where this species is extensively naturalized. It is a much smaller plant than *C. coronopifolia* (see Arizona Flora p. 938), annual, with pinnately dissected leaves, more or less villous herbage, and heads only about 3 mm. in diameter.

MICROSERIS. A second species of this genus was recorded for Arizona by Kenton L. Chambers in his "Biosystematic Study of the Annual Species of Microseris" (Contrib. Dudley Herbarium 4: 207-312). It is *M. heterocarpa* (Nutt.) K. Chambers, of which a collection on the San Carlos Indian Reservation, Gila Co. *(A. & R. Nelson 1848)* was listed (ibid. p. 288). *Microseris heterocarpa* differs from *M. linearifolia* (Arizona Flora p. 959) in the stouter and usually longer awn of the paleae, beakless achenes, etc. In *M. linearifolia* the achenes are usually distinctly beaked.

Three trees that were not included in Arizona Flora have been reported by Dr. Horace S. Haskell as escapes from cultivation in this state. They are:

Lombardy poplar *(Populus nigra* L. var. *italica* Muenchh.). Oraibi, Navajo Co. *(Deaver 3774)*.

Tree-of-Heaven *(Ailanthus altissima* (Mill.) Swingle, family *Simarubaceae)*. Pecks Lake, Yavapai Co. *(M. A. Wetherill in 1956)*.

Chinaberry *(Melia Azedarach* L., family *Meliaceae)*. Pecks Lake, Yavapai Co. *(M. A. Wetherill in 1956)*.

CHANGES OF TAXONOMIC STATUS AND NOMENCLATURE*

Pinus spp. (pp. 53, 54). In his Check List of Native and Naturalized Trees of the United States (U. S. Dept. Agric. Agricultural Handb. 41: pp. 265-267. 1953) Elbert L. Little, Jr., adopted for *P. reflexa* (No. 6) the name *Pinus flexilis* James var. *reflexa* Engelm., citing as synonyms *P. strobiformis* Engelm. and *P. reflexa* (Engelm.) Engelm. He followed Shaw in reducing *P. chihuahuana* (No. 7) to varietal status under *P. leiophylla* and adopted for *P. latifolia* (No. 9) the older name *P. Engelmannii* Carr.

*The changes here recorded do not necessarily accord with the present writer's views.

Abies concolor (No. 1, p. 56). According to Little (ibid. p. 28) the author of this combination was Lindley, not Hoopes.

Torreyochloa (p. 82) was combined with *Puccinellia* by Robert T. Clausen (Rhodora 54: 42-45) but Church (ibid. pp. 197-200) argued for its maintenance as a genus.

Setaria lutescens (No. 1, p. 139). John R. Reeder (Rhodora 53: 27-30) concluded that this name is untenable and that the species should be known as *S. glauca* (L.) Beauv.

Cyperus aristatus (No. 6, p. 149). Fernald (Gray's Man. ed. 8, p. 242) adopted the name *C. inflexus* Muhl. for this species, citing as a synonym "*C. aristatus* of authors, non Rottb."

Eleocharis montevidensis (No. 9, p. 155) was reduced by Osten (An. Mus. Hist. Nat. Montevideo, ser. 2, 3: 183) to a subspecies of *E. montana* H. B. K.

Carex ebenea (No. 19, p. 161). L. Kelso (Biol. Leafl. No. 66, p. 23) reduced this taxon to varietal rank under *C. Haydeniana* Olney.

Salix pseudomonticola (No. 16, p. 213). Little, in his Check List of U. S. Trees (1953, p. 392), reduced this to synonymy under *S. padophylla* Rydb.

Betula fontinalis (p. 215) was listed by Little (ibid. p. 66) as a synonym of *B. occidentalis* Hook. var. *occidentalis*.

Eriogonum glandulosum (No. 13, p. 237). Mr. J. T. Howell (Leafl. West. Bot. 8: 37) has pointed out the fact that *E. glandulosum* Nutt. is not known to occur in Arizona. The collection cited in Arizona Flora is the type collection of *E. flexum* Jones, a different species.

Rumex occidentalis Wats. (No. 9, p. 245). This species apparently does not occur in Arizona, its place being taken by *R. densiflorus* Osterh. and *R. nematopodus* Rech. f. (see Leafl. W. Bot. 7: 166, 172). In the key to *Rumex* (Arizona Flora, pp. 243, 244) both species would come under second paragraph 2, belonging to Sect. B, *Simplicis* of Rechinger f. (see Bot. Publ. Field Mus. 17: 7), characterized by the lack of axillary shoots. Absence of callosities on the valves would place them under first paragraph 7 (Subsect. *Aquatici* of Rechinger (ibid.)). Since the valves in fruit are not more than 6 mm. long, both species would be entered under second paragraph 8 of the key in Arizona Flora, and under second paragraph 9 because the principal lateral leaf-veins are ascending or sub-erect. This para-

graph should now read: "9. Principal lateral veins ascending or suberect (9a)." Then insert:

9a. Flowering stems from a vertical root; longest pedicels 3–4 times as long as the perianth; valves in fruit 4–5 mm. long, 3–4 mm. wide..... ..... 9. *R. nematopodus*

9a. Flowering stems from a black, horizontal rootstock, this covered with rootlets; pedicels (as described) 1–1½ times as long as the perianth; valves in fruit 5–6 mm. long and wide .....9a. *R. densiflorus*

Both species seem to be local in Arizona, *R. nematopodus* being known only from the Huachuca Mts. and *R. densiflorus* only from the White Mts.

CHENOPODIUM (pp. 251-254). Herbert A. Wahl, in a paper entitled "A Preliminary Study of the Genus Chenopodium in North America" (Bartonia No. 27,-1954) presented data indicating that the following changes should be made in the treatment of this genus in Arizona Flora. For *C. incisum* (No. 2) he preferred the name *C. graveolens* Willd., citing *C. incisum* Poir. as a synonym (ibid. p. 7). *C. Watsoni* A. Nels. (No. 8) is apparently less common in Arizona than the distribution given in Arizona Flora would indicate. Specimens from Black Mesa, Navajo Co. *(Eastwood & Howell 6630, Deaver 3894)* were so identified by Wahl. For *C. arizonicum* (No. 9) should be substituted *C. Palmeri* Standley *(C. arizonicum* Standley as a synonym) and *C. neomexicanum* Standley, two closely related species, distinguished chiefly by the inflorescences, these leafless in *C. Palmeri,* moderately leafy in *C. neomexicanum,* also by size of the seeds, these not more than 1.1 mm. wide in *C. Palmeri,* up to 1.5 mm. in *C. neomexicanum. C. Berlandieri* (No. 10), according to Wahl, is represented in Arizona by var. *sinuatum* (Murr) Wahl and var. *Zschackei* (Murr) Murr, but the differences between these varieties seem rather vague. *C. leptophyllum* Nutt. *(C. inamoenum* Standley excl. the type), No. 11 in Arizona Flora, apparently is confined to the three counties there mentioned. *C. hians* Standley (No. 12) seems to be limited, in Arizona, to Coconino Co. For *C. pratericola* (No. 13) substitute: 13. *C. desiccatum* A. Nels. The fact that this name has priority over *C. pratericola* was noted by Wahl in a later publication (Field and Lab. 23: 22,-1955). The species is represented in Arizona by var. *desiccatum,* a low, usually diffusely branched plant with oblong or oval, entire leaves; and var. *leptophylloides* (Murr) Wahl *(C. pratericola* Rydb. var. *leptophylloides* Aellen), a tall,

erect plant with linear, lanceolate, or narrowly oblong leaves, the lower ones often somewhat 3-lobed. *C. Fremontii* (No. 14), as treated in Arizona Flora comprises, according to Wahl, 4 species: *C. Fremontii* Wats. (including forma *farinosum* Aellen), *C. atrovirens* Rydb., *C. incanum* (Wats.) Heller, and *C. incognitum* Wahl. These taxa are not always easy to distinguish by the characters given in Wahl's key (ibid. pp. 14, 15), but fruiting specimens of *C. incognitum* may be identified by the normally attached pericarp, whereas the other 3 taxa have the pericarp separable from the seed. *C. album* (No. 16) apparently is not common in Arizona. There seems to be no evidence of the occurrence in this state of *C. rubrum* (No. 6) and *C. albescens* (No. 15).

Amaranthus Torreyi (No. 4, p. 266). The identity of the taxon or taxa included under this name in Arizona Flora is doubtful. Standley (N. Amer. Flora 21 (2): 107) described *A. Torreyi* (Gray) Benth. as dioecious, although in the key to the species in Arizona Flora (p. 265, second paragraph 4) it was treated as a monoecious species. The Arizona plants may belong to *A. Pringlei* Wats., a name which Ivan M. Johnston (Jour. Arnold Arbor. 25: 155) cited as a synonym of *A. Torreyi* (Gray) Benth. The latter, however, is a *nomen ambiguum,* according to Jonathan Sauer (Madroño 13: 36–40) and he synonymized it partly with *A. Watsoni* Standl. and partly with *A. arenicola* I. M. Johnst., both dioecious. He cited only one Arizona collection of *A. Watsoni,* at Yuma *(Thornber in 1912)* and none of *A. arenicola.* The range of *A. Pringlei* as given by Standley (ibid. p. 110) could include Arizona, although he did not mention that state.

Acanthochiton Wrightii (p. 267). Sauer (ibid. p. 44) combined this genus with *Amaranthus* and designated our species *Amaranthus Acanthochiton* Sauer.

Stellaria umbellata Turcz. (No. 4, p. 293). According to Boivin (Svensk Bot. Tidskr. 50: 113, 114,–1956), this species is Asiatic, only. The Arizona plants previously referred to it are *S. gonomischa* Boivin. This taxon was recorded by Boivin only for Colorado and California, but is probably much more widely distributed in western mountain regions.

Philadelphus microphyllus (p. 366). A very different interpretation of this complex was presented by Shiu-ying Hu in her recently published monograph of the genus (see Journ. Arnold

Arbor. vol. 37, pp. 15-35). Instead of the single aggregate species recognized by C. Leo Hitchcock (Madroño 7: 35–56), she distinguished 11 species of "Section *Microphyllus,*" of which 7 were recorded as occurring in Arizona.

Swainsona (pp. 444, 445). Substitute *Sphaerophysa* for the name of the genus and *Sphaerophysa salsula* (Pall.) DC. for the name of the species.

Astragalus. R. C. Barneby (Amer. Midland Nat. 55: 477,–1956) has excluded *A. convallarius* Greene from the flora of Arizona and has raised to species status the two varieties representing *A. convallarius* in Arizona Flora (No. 4, p. 457), as *A. xiphoides* (Barneby) Barneby and *A. titanophilus* Barneby *(A. convallarius* var. *foliolatus* Barneby). Both of these species have the stipules free, whereas in *A. convallarius* they are united below into a "contrapetiolar sheath."

Astragalus sesquiflorus Wats. (No. 25, p. 461). Barneby (ibid. p. 478) has described the Arizona representatives of this species as var. *brevipes* Barneby, limiting var. *sesquiflorus* to southwestern Utah.

Astragalus crassicarpus Nutt. (No. 72, p. 469). Regarding the Arizona representatives of this species, Barneby (ibid. p. 498) stated: "This southern form resembles var. *Paysoni* [(Kelso) Barneby] in nearly every way, but the pod is strongly inflated, with thin walls and a large empty cavity, very unlike the solid fruit of *A. crassicarpus.* The material at hand is as yet insufficient for adequate analysis, but a distinct taxon is assuredly involved."

Aeschynomene (p. 472). According to Rudd (Contrib. U. S. Nat. Herb. 32 (1): 33), the Arizona species is *A. villosa* Poir., which differs from *A. americana* in having hispid, not conspicuously veiny fruits, these, in *A. americana,* being glabrous or puberulent and reticulate-veiny.

Tetracoccus Hallii (p. 503). Dressler (Rhodora 56: 57) reduced this taxon to varietal status as *T. fasciculatus* (Wats.) Croizat var. *Hallii* (Brandeg.) Dressler.

Ditaxis (pp. 505, 506) has been reduced by Croizat (Jour. Arnold Arbor. 26: 191) to a subgenus of *Argythamnia* P. Browne. The 7 species in Arizona Flora would be renamed, accordingly: 1. *Argythamnia adenophora* Gray; 2. *A. mercurialina* (Nutt.) Muell. Arg.; 3. *A. cyanophylla* (Woot. & Standl.) Ingram; 4. *A.*

Brandegei Millsp. and var. *intonsa* (I. M. Johnst.) Ingram; 5. *A. lanceolata* (Benth.) Muell. Arg.; 6. *A. neomexicana* Muell. Arg.; 7. *A. serrata* (Torr.) Muell. Arg. The status of *A. Clariana* Jepson (Fl. Calif. 2: 419) is uncertain. Jepson included Arizona in the range of this taxon.

Mentzelia albicaulis (No. 7, p. 566). In the light of data given by H. J. Thompson and Harlan Lewis (Madroño 13: 103), all but the last sentence of the second paragraph under this species in Arizona Flora should be deleted. They recognized *M. Veatchiana* Kellogg as a species and stated that it has petals 7–12 mm. long, as compared with only 3–6 mm. in *M. albicaulis*.

Mentzelia pumila (No. 9). Thompson and Lewis (ibid. p. 106) apparently recognize *M. multiflora* (Nutt.) Gray as a species. They made no mention of *M. pumila* (Nutt.) Torr. & Gray, of which *M. multiflora* was treated as a variety in Arizona Flora, following Urban and Gilg.

Clarkia (p. 592). The merger of *Godetia* with *Clarkia*, by Lewis and Lewis, was noted in an earlier paper (Leafl. West. Bot. 7: 174). Since that note was written, these authors have published "The Genus Clarkia" (Univ. Calif. Publ. Bot. 20: 241–392,—1955), including 3 species that occur in Arizona. These are: *C. rhomboidea* Dougl., *C. purpurea* (Curtis) Nels. & Macbr. subsp. *quadrivulnera* (Dougl.) Lewis & Lewis (*Godetia quadrivulnera* (Dougl.) Spach.), and *C. epilobioides* (Nutt.) Nels. & Macbr. (*Godetia epilobioides* (Nutt.) Wats.). These taxa are readily identifiable by the characters given under *Clarkia* and *Godetia* in Arizona Flora (pp. 592, 593).

Myriophyllum exalbescens (No. 2, p. 605). P. Patten (Rhodora 56: 223, 224) concluded that this taxon should be relegated to subspecific status, as *M. spicatum* L. subsp. *exalbescens* (Fern.) Hultén (*M. spicatum* var. *exalbescens* (Fern.) Jepson).

Asclepias (pp. 657–663). Robert E. Woodson, Jr., in a paper entitled "The North American Species of Asclepias, L." (Ann. Mo. Bot. Gard. 41: 1–211) gave data that indicate certain changes which should be made in the treatment of this genus in Arizona Flora. He recognized as a species (ibid. p. 183) *A. Rusbyi* (Vail) Woodson, this taxon having been given varietal status under *A. Engelmanniana* Woodson (No. 2, p. 660) in Arizona Flora. Probably many of the Arizona specimens referred previously to *A. Engelmanniana* are *A. Rusbyi*. Woodson (ibid. p.

193) took up for *A. capricornu* Woodson (No. 4 in Arizona Flora, p. 660) the name *A. asperula* (Dcne.) Woodson, referring the Arizona plants to subsp. *asperula*. The Arizona representatives of *A. tuberosa* (No. 7, p. 661 in Arizona Flora) were later referred by Woodson (ibid. p. 75) to subsp. *terminalis* Woodson, instead of the more eastern subsp. *interior* (Woodson) Woodson. The range of *A. fascicularis* (No. 10, p. 661 in Arizona Flora) as stated by Woodson (ibid. p. 65) does not include Arizona, but he mentioned intergradations between this species and *A. subverticillata* "throughout the southern Great Basin area."

Gilia gilioides (No. 4, p. 690). This species was transferred by A. and V. Grant (El Aliso 3: 105) to their new genus *Allophyllum*, as *A. gilioides* (Benth.) A. & V. Grant.

Macromeria viridiflora (p. 724). I. M. Johnston (Jour. Arnold Arboretum 35: 13) referred the Arizona plants mainly to the relatively small-flowered var. *Thurberi* (Gray) I. M. Johnst., but stated that typical *M. viridiflora* occurs in the Chiricahua and Huachuca Mts.

Monardella odoratissima (No. 1, p. 747). The synonym in line 1 should be deleted and a second paragraph inserted: "This species is represented in Arizona by subsp. *parvifolia* (Greene) Epling (*M. parvifolia* Greene)."

Sambucus neomexicana (No. 3, p. 813). In the latest Check List of U. S. Trees (p. 396) this taxon was reduced by Little to synonymy under *S. glauca* Nutt., but the reduction of status seems questionable. Also the name *S. glauca* is preferred to *S. coerulea Raf.* (No. 6, p. 814), the latter being designated a "nomen subnudum."

Range Extensions and Additional Records of Rarer Taxa

Equisetum laevigatum (No. 2, p. 30). Apache Co.

Pellaea limitanea and *P. Jonesii* (Nos. 1 and 2, p. 37). Both species occur at Toroweap Point, northern Mohave Co. *(McClintock 52-242, 52-243a).*

Notholaena sinuata (No. 2, p. 41) var. *integerrima*. Mohave Co.

Pinus edulis (No. 2, p. 52). Grand Canyon National Monument, Mohave Co.; also in southeastern California.

Picea pungens (No. 2, p. 55). Apparently also on the west fork of Oak Creek *(Haskell & Deaver 2011).*

Ephedra viridis (No. 3, p. 61). Apache Co.

Typha domingensis (No. 2, p. 64). Apache and Pima Cos.

Alisma subcordatum (No. 2, p. 68). Swamp Lake, Grand Canyon, 7700 feet *(Collom 1831).*

Bromus marginatus (No. 4, p. 77). Maricopa and Cochise Cos.

B. inermis (No. 5, p. 77). Several additional localities in Coconino Co.

B. frondosus (No. 10, p. 78). Yavapai and Santa Cruz Cos.

B. commutatus (No. 13, p. 78). Reported also from the Lukachukai Mts., Apache Co., 7500 feet *(Phillips & Gould 4818)*.

Festuca elatior (No. 9, p. 80). Pinetop, Navajo Co.

Poa Bigelovii (No. 1, p. 83). Yuma Co.

P. compressa (No. 6, p. 84). Pinetop, Navajo Co., and North Rim of Grand Canyon.

Eragrostis intermedia (No. 14, p. 87). Mohave Co.

Tridens elongatus (No. 5, p. 91). Navajo and Mohave Cos.

Cottea pappophoroides (p. 91). Santa Cruz Co.

Agropyron desertorum (No. 6, p. 93). Keams Canyon, Navajo Co.

A. subsecundum (No. 8, p. 94). Montezuma Castle, Yavapai Co.

Deschampsia elongata (No. 2, p. 100). North Rim of Grand Canyon, Coconino Co.

Avena fatua (No. 1, p. 100). Santa Cruz Co.

Danthonia intermedia (No. 1, p. 101). North Rim of Grand Canyon.

Agrostis idahoensis (No. 6, p. 103). Additional collections have been made on the Kaibab Plateau *(Merkle 964, 968)*.

Polypogon interruptus (No. 2, p. 104). Reported from Alamo Crossing, Yuma Co. *(Gould & Darrow 4334)*.

Lycurus phleoides (p. 104). Northeastern Mohave Co.

Muhlenbergia sinuosa (No. 1, p. 108). Graham Co.

M. minutissima (No. 4, p. 108). Mt. Trumbull, Mohave Co. *(Merkle 939)*.

M. Richardsonis (No. 20, p. 110). North Rim of Grand Canyon *(Merkle 975)*.

M. curtifolia (No. 22, p. 110). Apparently also at Toroweap, northeastern Mohave Co., 4500 feet *(Cottam 13323)*.

M. Porteri (No. 38, p. 111). Santa Cruz Co.

Sporobolus airoides (No. 8, p. 114). Mohave and Yuma Cos.

S. Wrightii (No. 9, p. 114). Yuma Co.

S. contractus (No. 13, p. 114). Yuma Co.

Stipa Lettermani (No. 13, p. 118). Apparently also on Black Mesa, Apache Co., 8500 feet *(Deaver 3907)*.

Aristida Wrightii (No. 15, p. 121). Apparently also in Havasu Canyon, Coconino Co. *(J. T. Howell 26387)*.

Bouteloua simplex (No. 1, p. 127). Mt. Trumbull, northern Mohave Co. *(Merkle 938a)*.

Leersia oryzoides (p. 131). Sedona, southern Coconino Co. *(Deaver 4836)*.

Cyperus laevigatus (No. 1, p. 149). Burro Creek, Mohave Co.

C. aristatus (No. 6, p. 149). Yuma Co.

C. esculentus (No. 17, p. 150). Yuma Co.

Scirpus americanus (No. 5, p. 152), var. *polyphyllus*. Burro Creek, western Yavapai Co. *(Gould & Darrow 4220)*.

Eleocharis montevidensis (No. 9, p. 155). Near Safford, Graham Co. *(Blakely 1496)*.

Yucca elata (No. 9, p. 188). Northern Yuma Co.; also in northern Mexico.

Agave Parryi (No. 7, p. 194), var. *huachucensis*. In line 9 on p. 195, read "Huachuca Mountains and westward into Santa Cruz County."

Salix Bonplandiana (No. 13, p. 213). Cochise Co.

Ostrya Knowltoni (p. 214). Toroweap, Mohave Co.

Eriogonum pharnaceoides (No. 11, p. 237). Northeastern Mohave Co.

E. trichopes (No. 15, p. 238). Reported from Havasu Canyon, western Coconino Co.

E. alatum (No. 30, p. 239). Probably also in northeastern Mohave Co.

E. Bakeri (No. 35, p. 240). Black Mesa, Apache Co.

E. Pringlei (No. 45, p. 241). Castle Dome Mts., Yuma Co.

E. racemosum (No. 46, p. 241). Mt. Trumbull, northern Mohave Co.

E. corymbosum (No. 53, p. 242). Northeastern Mohave Co.

E. Mearnsii (No. 57, p. 243), var. *pulchrum*. Northeastern Mohave Co.

Rumex triangulivalvis (No. 6, p. 244). Northeastern Mohave Co.

Polygonum Convolvulus (No. 1, p. 247). Mt. Trumbull, northern Mohave Co.

P. Kelloggii (No. 2, p. 247). Additional collections have been made on North Rim of Grand Canyon *(Merkle 669, 672)*.

P. aviculare (No. 4, p. 247). Apache and Mohave Cos.

P. pensylvanicum (No. 13, p. 248). Escudilla Mt., Apache Co., and delta of Williams River, southern Mohave Co.

Chenopodium incisum (No. 2, p. 252). Northeastern Mohave Co.

Atriplex semibaccata (No. 3, p. 257). Pinal Co.

A. Powellii (No. 6, p. 257). Santa Rita Mts., Pima or Santa Cruz Co.

A. Wrightii (No. 9, p. 258). Santa Cruz Co.

A. Jonesii (No. 13, p. 258). Also in southeastern Utah.

Bassia hyssopifolia (p. 261). Apache Co.

Kochia scoparia (No. 2, p. 261), var. *subvillosa*. Abundant at Seligman, Yavapai Co. *(K. F. Parker 8410)*.

Mirabilis oxybaphoides (No. 1, p. 272). Northern Mohave Co.

Oxybaphus pumilus (No. 1, p. 273). Probably also in Apache Co.

O. comatus (No. 2, p. 273). Escudilla Mt., southern Apache Co. and apparently also on Mt. Trumbull, Mohave Co.

Boerhaavia intermedia (No. 9, p. 276). Yuma Co.

Commicarpus scandens (p. 277). Santa Cruz Co.

Abronia fragrans (No. 5, p. 278). Collected in northern Apache Co. also by Deaver *(No. 4040)*.

Mollugo Cerviana (No. 2, p. 280). Northeastern Mohave Co.

Trianthema Portulacastrum (p. 281). Santa Cruz Co.

Cerastium vulgatum (No. 2, p. 294). Near Prescott, Yavapai Co.

Ceratophyllum demersum (p. 304). Apache Co.

Delphinium scaposum (No. 2, p. 308). Yuma Co.

Clematis Drummondii (No. 1, p. 312). Yuma Co.

Ranunculus sceleratus (No. 5, p. 316). Winslow and Showlow, Navajo Co. *(Michaels 842, Hamilton in 1955)*.

Berberis repens (No. 3, p. 321). Mohave Co.

B. haematocarpa (No. 6, p. 321). Occurs also in southeastern California.

Cocculus diversifolius (p. 321). Santa Cruz Co.

Argemone intermedia (No. 2, p. 324). Mohave Co.

Stanleya albescens (No. 3, p. 329). Black Mt., Navajo Co.

Thelypodium Wrightii (No. 1, p. 329). Apache Co.

T. integrifolium (No. 6, p. 330). Grand Canyon National Monument, Mohave Co.

Lepidium lasiocarpum (No. 7, p. 334), var. *Wrightii*. Yuma Co.

Rorippa obtusa (No. 8, p. 340). Escudilla Mt., southern Apache Co., 8500 feet, and Kaibab Plateau, Coconino Co.

Lesquerella Fendleri (No. 3, p. 343). Gila Co.

L. Wardii (No. 5, p. 343). V. T. Park, Kaibab Plateau, Coconino Co. *(Merkle 762).*

Draba asprella (No. 1, p. 346), var. *stelligera*. Southern Navajo Co. *(Barneby 12616).*

D. petrophila (No. 5, p. 346). Probably also on Escudilla Mt., southern Apache Co.

Arabis glabra (No. 1, p. 352). Reported also from Havasu Canyon, Coconino Co.

Erysimum repandum (No. 1, p. 354). Northeastern Mohave Co.

E. inconspicuum (No. 3, p. 354). Northern Navajo Co. and widely distributed in Coconino Co.

Cleome serrulata (No. 2, p. 356). Graham Co.

C. lutea (No. 3, p. 356). Northeastern Mohave Co.

Wislizenia refracta (p. 357). Yuma Co.

Polanisia trachysperma (p. 358). Toroweap Valley, northeastern Mohave Co.

Fendlera rupicola (p. 367). Grand Canyon National Monument, northeastern Mohave Co.

Ribes aureum (No. 2, p. 369). Coconino Co.

R. cereum (No. 5, p. 370). Northeastern Mohave Co.

Amelanchier oreophila (No. 5, p. 377). Mohave Co.

Potentilla pensylvanica (No. 16, p. 385). Also in eastern California.

Fallugia paradoxa (p. 387). Santa Cruz Co.

Cercocarpus intricatus (No. 2, p. 389). Northern Apache Co.

C. montanus (No. 5, p. 390). Northeastern Mohave Co.

Purshia tridentata (p. 391). Northeastern Mohave Co.

Rosa neomexicana (No. 3, p. 393). Walnut Canyon, Coconino Co.

Prunus fasciculata (No. 1, p. 394). Southwestern Yavapai Co.

P. emarginata (No. 2, p. 394). Grand Canyon National Monument, Mohave Co.

Acacia Greggii (No. 2, p. 398). Santa Cruz Co.

A. angustissima (No. 3, p. 399), subsp. *Lemmonii*. In lines 4 and 5 of this page read: "known only from the mountains of Cochise County, the type *(Lemmon* in 1882) from the Huachuca Mountains."

A. constricta (No. 5, p. 399). Santa Cruz Co.

Cassia armata (No. 1, p. 405). Also in Baja California.

Cercidium floridum (No. 2, p. 407). Santa Cruz Co. and reported from Cochise Co.

Hoffmanseggia densiflora (No. 4, p. 408). Santa Cruz Co.

Lupinus argenteus (No. 16, p. 418). Mt. Trumbull, northern Mohave Co.

Medicago hispida (No. 3, p. 421). Santa Cruz Co.

Melilotus albus (No. 3, p. 422). Apache Co.

Trifolium pratense (No. 14, p. 424). Pinetop, Navajo Co., Oak Creek Canyon, Yavapai (?) Co.

T. Rusbyi (No. 17, p. 425). South of Flagstaff, Coconino Co.

Lotus Purshianus (No. 4, p. 427). Northeastern Mohave Co.

Psoralea mephitica (No. 3, p. 430), var. *retrorsa*. Near Globe, Gila Co. *(Barneby 12636)*.

Dalea urceolata (No. 16, p. 437). Flagstaff *(B. Downer in 1953)*.

Olneya Tesota (p. 442). Southwestern Mohave Co.

Astragalus kaibensis (No. 6, p. 457). Near Navajo Bridge, Coconino Co., 4000 feet *(Peebles & Parker 14644)*.

A. Haydenianus (No. 7, p. 457). Piute Rock, northern Apache Co. *(Starr 90)*.

A. amphioxys (No. 14, p. 458), var. *vespertinus*. Bright Angel Trail, Grand Canyon *(Eastwood 6073)*.

A. albulus (No. 21, p. 461). The collection from Richville Valley *(Richey in 1950)* cited in Leafl. West. Bot. 7:10, has been identified subsequently as *A. Hallii* Gray, but an additional collection of *A. albulus* from 11 miles south of St. Johns, Apache Co. *(Ownbey & Ownbey 3021)* should be mentioned. The collectors described the corolla-color as "ocholeucous."

A. desperatus (No. 27, p. 461), var. *desperatus*. Between Jacobs Lake and Kanab, Coconino Co. *(Eastwood & Howell 1128)*; near Navajo Bridge, Coconino Co., in a sandy wash *(Barneby 12668)*. Var *conspectus* Barneby (p. 462) has been collected also near Fredonia, Coconino Co., on barren sandstone hills *(Barneby 12676)*.

A. Beathii (No. 46, p. 464). South of Cameron, Coconino Co., 4500 feet, in red clay soil *(Ripley & Barneby 4880)*, and between Flagstaff and Cameron *(Deaver 1982)*.

A. cobrensis (No. 51, p. 465). Pinal Peak, Gila Co., 5500 feet, open stony slopes in pine forest *(Barneby 12641)*.

A. Egglestonii (No. 53, p. 465). Nutrioso, southern Apache Co., in a grassy mountain meadow *(Ripley & Barneby 5063)*.

A. eremiticus (No. 55, p. 465). Mohave Co., north of Wolf Hole, and near Toroweap Point, on red sandstone with pinyon and juniper.

A. lentiginosus (No. 56, p. 466), var. *Wilsonii*. Northwestern Gila Co., between Pine and the Verde River, 3750 feet, clay hillside with oaks and pinyon *(Barneby 12654)*.

A. Bigelovii (No. 68, p. 469), var. *mogollonicus* (Greene) Barneby. Point of Pines, Graham Co., 6200 feet, "with grama and lupine" *(V. Bohrer 322)*.

Desmodium neomexicanum (No. 8, p. 475). Coconino Co.

Galactia Wrightii (p. 480). Maricopa Co.

Geranium Parryi (No. 2, p. 485). White Mountains, Apache Co. *(Michaels in 1955)*.

G. eremophilum (No. 7, p. 486). Mt. Trumbull, northern Mohave Co.

G. caespitosum (No. 8, p. 486). Mt. Trumbull, Mohave Co.

Erodium texanum (No. 1, p. 486). Mohave and Yuma Cos.

Choisya arizonica (No. 1, p. 493). Also in northern Sonora.

C. mollis (No. 2, p. 494). Also in northern Sonora.

Thamnosma montana (No. 1, p. 494). Along the Little Colorado River, Coconino (?) Co.

Polygala subspinosa (No. 11, p. 500). Kanab Plateau, northern Mohave Co., 6000 feet *(Cottam 14001)*.

Tetracoccus Hallii (p. 503). Castle Dome Mts. and between Quartzite and Cibola, Yuma Co.

Euphorbia Fendleri (No. 31, p. 519). Graham and Gila Cos.

E. Abramsiana (No. 41, p. 520). Santa Cruz Co.

Glossopetalon nevadense (No. 1, p. 526). Northern and eastern Yavapai Co.

Condalia spathulata (No. 3, p. 530). Also in southeastern California.

Ceanothus Martini (No. 3, p. 534). Northeastern Mohave Co.

Horsfordia alata (No. 2, p. 540). Castle Dome Mts., Yuma Co.

Sphaeralcea Rusbyi (No. 6, p. 543). Mohave Co.

Malva neglecta (No. 2, p. 549). Northeastern Mohave Co.

Mentzelia involucrata (No. 1, p. 565). Mohave Co.

M. puberula (No. 10, p. 566). Near Toroweap Point, northern Mohave Co.

Carnegiea gigantea (p. 569). Reported from northwestern Cochise Co.

Echinocactus polycephalus (No. 3, p. 573). Reported from Havasu Canyon, western Coconino Co.

Ferocactus acanthodes (No. 3, p. 573). Reported from Havasu Canyon.

Ammannia coccinea (No. 2, p. 588). Mohave Co.

Epilobium saximontanum (No. 5, p. 592). Kaibab Basin and North Rim of Grand Canyon, Coconino Co.

Oenothera cavernae (No. 14, p. 598). Grand Canyon National Monument, northeastern Mohave Co.

O. Boothii (No. 29, p. 600). Grand Canyon National Monument and near Mt. Trumbull, northern Mohave Co., 4000–6000 feet *(Cottam 13936, Jaeger in 1941)*.

Gaura parviflora (No. 1, p. 603). Santa Cruz Co.

Conium maculatum (p. 614). Seligman, Yavapai Co.

Heracleum lanatum (p. 623). North Fork of White River, Apache Co.

Garrya Wrightii (No. 2, p. 625). Mt. Elden, Coconino Co.

Pterospora andromedea (p. 630). Mt. Trumbull, northern Mohave Co.

Primula Hunnewellii (No. 4, p. 636). Cliff Springs, North Rim of Grand Canyon *(Merkle 777)*.

Androsace septentrionalis (No. 2, p. 636), var. *glandulosa* (p. 637). Kaibab Plateau, Coconino Co.

Dodecatheon Ellisiae (No. 1, p. 639). White Mts., Greenlee Co.

D. alpinum (No. 3, p. 639). White Mts., Greenlee Co.; "Park Gate," Coconino Co.

Fraxinus Gooddingii (No. 4, p. 642, as *F. Greggii*). Several collections have been made in Santa Cruz Co. west of Nogales, including the type *(Goodding in 1936)*. Also in northeastern Sonora.

Gentiana strictiflora (No. 14, p. 649). Mt. Trumbull, northern Mohave Co.

Swertia radiata (No. 2, p. 650). Mt. Trumbull, Mohave Co.

Apocynum Suksdorfii (No. 1, p. 654). Point of Pines, Graham Co.

Asclepias Engelmanniana (No. 2, p. 660). Gila and Santa Cruz Cos.; also in northern Mexico.

A. albicans (No. 5, p. 660). Also in Baja California.

A. subulata (No. 6, p. 661). Yavapai and Pima Cos.; also in southern Nevada.

A. subverticillata (No. 9, p. 661). Northeastern Mohave Co.

A. Linaria (No. 12, p. 661). Greenlee and Yuma Cos.

A. quinquedentata (No. 13, p. 661). Reported by Woodson from Coconino Co.

A. speciosa (No. 20, p. 662). Maricopa Co.

A. latifolia (No. 27, p. 663). Reported by Woodson from Graham and Santa Cruz Cos.

Funastrum hirtellum (No. 3, p. 664). Probably in northern Yuma Co.

Convolvulus arvensis (No. 2, p. 674). Mohave Co.

Navarretia Breweri (No. 1, p. 684). Near Mt. Trumbull, northern Mohave Co. *(Jaeger in 1941).*

Gilia polyantha (No. 19, p. 692). Mohave Co., near Mt. Trumbull, where growing with *Artemisia* in juniper-pine forest *(Robbins 2200),* and on the Kanab Plateau *(Cottam 13893).*

Phacelia affinis (No. 13, p. 702). Mohave Co.

P. magellanica (No. 16, p. 702). Northeastern Mohave Co.

P. integrifolia (No. 22, p. 703). Northeastern Mohave Co.

Nama dichotomum (No. 2, p. 705). Summit of Mt. Trumbull, northern Mohave Co.

Pectocarya recurvata (No. 4, p. 712). Reported from Havasu Canyon, western Coconino Co., by Deaver and Haskell (Plateau 28: 21).

Cryptantha abata (No. 9, p. 718). Havasu Canyon.

C. gracilis (No. 13, p. 719). Havasu Canyon, also Toroweap Valley, northeastern Mohave Co.

C. recurvata (No. 15, p. 719). Havasu Canyon, also Grand Canyon National Monument, Mohave Co.

C. crassisepala (No. 20, p. 719). Havasu Canyon.

C. holoptera (No. 25, p. 710). Reported from Havasu Canyon by Deaver and Haskell (Plateau 28: 20).

C. barbigera (No. 30, p. 721). Santa Cruz Co.

Amsinckia tessellata (No. 2, p. 723). Yuma Co.

Lithospermum multiflorum (No. 3, p. 724). Santa Cruz Co.

Agastache pallidiflora (No. 6, p. 737), subsp. *neomexicana* occurs, apparently, also on the Kaibab Plateau, Coconino Co. *(K. F. Parker 6226).*

Moldavica parviflora (p. 738). Graham Co.

Leonurus Cardiaca (p. 739). Mt. Trumbull, northern Mohave Co. *(Merkle 942).*

Salvia subincisa (No. 10, p. 742). Graham Co.

S. reflexa (No. 11, p. 743). Northeastern Mohave Co.

Hedeoma nanum (No. 2, p. 745), subsp. *californicum.* Havasu Canyon, western Coconino Co.

Chamaesaracha Coronopus (No. 1, p. 752). Northeastern Mohave Co.

Solanum Fendleri (No. 6, p. 758). Southern Apache Co.

S. triflorum (No. 10, p. 758). Northern Mohave Co.

S. americanum (No. 14, p. 759). Reported from Havasu Canyon by Deaver and Haskell (Plateau 28: 21).

Verbascum Thapsus (p. 764). Mohave and Yuma Cos.

Collinsia parviflora (p. 767). Uinkaret Plateau, northern Mohave Co.

Penstemon pseudospectabilis (No. 16, p. 774). Reported from Havasu Canyon, western Coconino Co., by Deaver and Haskell (Plateau 28:21).

P. oliganthus (No. 25, p. 776). Escudilla Mt., southern Apache Co.

P. Rydbergii (No. 27, p. 776). Another collection has been made on the North Rim of Grand Canyon, about 8000 feet *(Merkle 506)*.

P. virgatus (No. 35, p. 778), subsp. *arizonicus* (Gray) Keck. Escudilla Mt., southern Apache Co.

Mimulus Bigelovii (No. 4, p. 781). Mt. Trumbull, northern Mohave Co., 7500 feet, in volcanic soil, flowering in August.

M. nasutus (No. 9, p. 781). Apparently also in northeastern Mohave Co. *(McClintock 52–534)*.

Gratiola neglecta (p. 782). Mormon Lake, Coconino Co. *(Deaver 4901)*.

Limosella aquatica (p. 783). Near Greer, Apache Co. *(Leydendecker in 1955)*.

Castilleja linariaefolia (No. 9, p. 789). Near Toroweap Point, northeastern Mohave Co.

Cordylanthus parviflorus (No. 6, p. 791). Toroweap and near Mt. Trumbull, northern Mohave Co.

Pedicularis centranthera (No. 4, p. 793). Navajo Co.

Proboscidea parviflora (No. 1, p. 795). Yavapai Co.

P. arenaria (No. 2, p. 796). Apparently also in Havasu Canyon, Coconino Co. *(Deaver 4454)*.

Orobanche multiflora (No. 2, p. 797), var. *arenosa* has been reported from Havasu Canyon, Coconino Co. by Deaver and Haskell (Plateau 28: 21).

Plantago argyraea (No. 11, p. 805). Apache Co.

Galium boreale (No. 14, p. 812). White River, Apache Co. *(Michaels in 1955)*; Big Lake, Apache Co. *(Deaver 4690)*.

Sambucus neomexicana (No. 3, p. 813). Southern Apache Co.

S. coerulea (No. 6, p. 814). Grand Canyon National Monument, northeastern Mohave Co. *(Cottam 14041)*.

Symphoricarpos Parishii (No. 2, p. 815). Grand Canyon National Monument, northeastern Mohave Co.

Lonicera arizonica (No. 4, p. 817). Sierra Ancha, Gila Co.

Valeriana edulis (No. 1, p. 819). Gila Co.

V. arizonica (No. 3, p. 819). Cochise Co.

Cucurbita foetidissima (No. 1, p. 822). Santa Cruz Co.

Brickellia longifolia (No. 1, p. 848). Reported from Betatakin Canyon, Navajo Co.

Grindelia arizonica (No. 4, p. 852). Greenlee Co.

Chrysopsis viscida (No. 6, p. 856). Toroweap Point, northeastern Mohave Co.

Solidago decumbens (No. 2, p. 857). Escudilla Mt., southern Apache Co.

S. missouriensis (No. 3, p. 857). A collection in Grand Canyon National Monument, northeastern Mohave Co. *(Cottam 13531)* seems to be of this species, but the stems are puberulent.

Chrysothamnus pulchellus (No. 4, p. 863). Kaibito Plateau, Coconino Co. *(Love 8855).*

C. viscidiflorus (No. 5, p. 864), var. *stenophyllus*. Northeastern Mohave Co.

Aster arenosus (No. 9, p. 872). Northeastern Mohave Co.

A. tanacetifolius (No. 18, p. 873). Apache and Mohave Cos.

A. aquifolius (No. 23, p. 874). Escudilla Mt., southern Apache Co.

Baccharis sergilloides (No. 4, p. 883). Also in southern Nevada.

Dicoria canescens (No. 2, p. 893). Mohave Co.

Ambrosia aptera (No. 1, p. 894). Also in southeastern Utah.

Franseria ambrosioides (No. 8, p. 896). Southern Mohave Co.

Helianthus anomalus (No. 3, p. 903). Uinkaret Plateau, northeastern Mohave Co. *(Cottam 13926).*

Verbesina encelioides (No. 3, p. 907). Santa Cruz Co.

Thelesperma megapotamicum (No. 1, p. 909). Coconino and Mohave Cos.

Hymenopappus lugens (No. 4, p. 919). Graham Co.

Eriophyllum lanosum (No. 5, p. 921). Betatakin, Navajo Co.

Chaenactis macrantha (No. 4, p. 922). Almost throughout Mohave Co.

C. Douglasii (No. 6, p. 923). Grand Canyon National Monument, Mohave Co. *(Cottam 13992).*

Bahia Woodhousei (No. 6, p. 925). Flagstaff, Coconino Co., 7000 feet *(Deaver 2304);* Daggs Reservoir, Navajo Co. *(Michaels 709).*

Gaillardia Parryi (No. 3, p. 930). Toroweap Point, northeastern Mohave Co., in gypsum soil *(Cottam 14025).*

Dyssodia papposa (No. 5, p. 933). Apache Co.

D. pentachaeta (No. 8, p. 933). Toroweap Point, northeastern Mohave Co.

Artemisia Carruthii (No. 3, p. 940). Mt. Trumbull, northern Mohave Co., about 5000 feet.

A. Bigelovii (No. 6, p. 941). Mohave Co.

A. tridentata (No. 11, p. 941). Northeastern Mohave Co.

A. nova (No. 12, p. 942). Almost throughout Coconino Co. and Grand Canyon National Monument, Mohave Co.

Tetradymia canescens (No. 2, p. 944). Apache Co.

Senecio millelobatus (No. 10, p. 948). Toroweap Valley, northeastern Mohave Co.

Cirsium Parryi (No. 2, p. 952). Escudilla Mt., southern Apache Co.

C. pulchellum (No. 10, p. 953). Kaibito Spring, Coconino Co.

Centaurea melitensis (No. 3, p. 955). Yuma Co.

C. Picris (No. 5, p. 956). Near Flagstaff, Coconino Co.

Microseris linearifolia (p. 959). Graham and Yuma Cos.

Stephanomeria Thurberi (No. 2, p. 960). Graham Co.

Tragopogon dubius (No. 3, p. 962). Apache Co.

Sonchus oleraceus (No. 2, p. 965). Santa Cruz Co.

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LEAFLETS
of
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1932—1957

On this, the twenty-fifth anniversary of the founding of Leaflets of Western Botany, I wish to honor and to thank those who have been most closely associated with our little journal through the years. Of the ten contributors on this occasion, six also contributed to Volume I, and the others have, in one special way or another, been partly responsible for whatever success the journal may have achieved.

Leaflets of Western Botany could not have begun without the support and co-sponsorship of Alice Eastwood and it is gratifying to remember her in this issue not only in a short paper that she left unpublished but particularly in Mr. and Mrs. Cantelow's set of biographical sketches of people whom Miss Eastwood commemorated in the names of plants. As a contributor, the late Thomas H. Kearney did not appear in Leaflets' pages until well along in Volume IV, but from that time on he was a generous contributor, so I am especially happy to be able to offer his unpublished paper on *Gossypium* that not only summarizes the fascinating systematic and phytogeographic problems relating to that genus, but also recalls the economically and botanically important work Dr. Kearney did in the development of Pima Cotton. Dwight Ripley and Eric Walther in their articles bring back to this issue the horticultural aspect of western botany which was a feature of Volume I but which has been too-long absent from the journal's pages.

On this occasion I would like to express my gratitude to several institutions and organizations for their help and cooperation through the years. First I would like to thank the able printers who have faithfully attended to our exacting editorial demands — the James H. Barry Company in whose press rooms Leaflets first saw the light of day twenty-five years ago and where it was printed through the year 1947; and James J. Gillick & Company who have continued to provide expert service from 1948 to the present. In the spirit of good-will the Bank of California has attended to the financial accounting of the journal

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and has cared for its all-too-often diminutive deposit. For many years the California Botanical Club has generously sponsored one issue each year, in spite of the fact that the members as individuals might have been little attracted to accounts about new Californian weeds or old western collectors. And to the California Academy of Sciences I am especially grateful, not only for the financial help its Board of Trustees has generously given but also for the privilege we have been granted in allowing the Academy's Department of Botany to be identified as the source of our journalistic contribution to western botany. — JOHN THOMAS HOWELL.

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BIOGRAPHICAL NOTES ON PERSONS IN WHOSE HONOR ALICE EASTWOOD NAMED NATIVE PLANTS

BY

ELLA DALES CANTELOW AND HERBERT CLAIR CANTELOW

Alice Eastwood was fond of reciting, "I count my age by friends, not years—and I am rich in friends." The list which follows includes the names of 101 people, most of whom she numbered among her friends. Her cordial, warm-hearted devotion to the friends it pleased her to honor is manifested many times in the dedicatory notes accompanying the descriptions she wrote of the new plants they brought to her or assisted her in discovering, often in remote places.

While the names of many distinguished men and women are encountered here, it is especially noteworthy that others may be described as ardent nature lovers who found joy in visiting the fields and woods and in carrying home interesting plant specimens, for study and identification.

At the end of each biographical sketch we give the plant name (or names) pertaining to the person concerned. Except for seven type specimens found in other herbaria,* the types on which these names rest are deposited in the California Academy of Sciences.

The facts presented here have been assembled at the request of John Thomas Howell, Curator of Botany, California Academy of Sciences. He in turn had received from Joseph Ewan, Associate Professor of Botany at Tulane University, New Orleans, the suggestion that such a compilation be undertaken before a lapse of time had raised too many difficulties. Both of these friends have given valuable help in various ways in the search for elusive information. The deepest appreciation should be expressed to them and to the many others, too numerous to mention individually, without whose help many necessary facts could not have been secured. We are grateful especially to the California State Library for valuable help graciously given.

*These are types of *Aristolochia Nelsonii*, *Castilleja Palmeri*, *C. Nelsonii*, *Diospyros Palmeri*, *Lupinus Tracyi*, *Orthocarpus Brownii*, and *Veronica Copelandii*. Data pertaining to the types in the California Academy of Sciences have been published by Mr. Howell in the Wasmann Collector in 1948 and 1949 and in the Wasmann Journal of Biology in 1950–53.

While every effort has been exerted to make the list complete, there is always the possibility that some person has been overlooked in a reference that has eluded us. Where complete data on birth and death do not appear, it is because the information has not been found.

ABBOTT, DR. EDWIN KIRK. Physician; born in Hartley, Canada, 27 Dec. 1840, died in Monterey, Calif., 11 June 1917. Graduate of Ann Arbor Medical School; early resident of Salinas, Calif., where he established the first drug store and maintained it for 34 years; served the county as weather observer for 40 years and rendered other public services; his favorite study was botany and he was an ardent collector of plants, especially in Monterey Co.; his herbarium was given to the Calif. Acad. Sci. by Mrs. Abbott after the doctor's death. *Malvastrum Abbottii.*

ADAMS, MARY (Mrs. Peter Peacock). Pioneer of Del Norte Co., Calif.; born in Waldo, Oregon, 16 May 1861, died at Adams Station, Del Norte Co., Calif., 13 July 1942. Moved to Gasquet Flat on the Crescent City-Grants Pass road in 1890; established Adams Station in 1898; married Peter Peacock, a popular stage-driver, 1908, but continued to be known as "Aunt Mary Adams." From Alice Eastwood we learn that she was a greatly respected woman who sent travelers on their way with much material for happy memories. *Anemone Adamsiana, Valeriana Adamsiana.*

ALVORD, WILLIAM. Business man; born in Albany, N. Y., 3 Jan. 1833, died in San Francisco, Calif., 21 Dec. 1904. Early president of the Calif. Acad. Sci.; Mayor of San Francisco 1871; Park Commissioner 1873–82; largely responsible for the early development of Golden Gate Park. He gave continuously and unselfishly of his services and wealth to promote the public good. Charter member of Calif. Bot. Club. *Quercus Alvordiana.*

AUSTIN, CAROLA JOSEPHINE. *See* Bruce, Mrs. Charles Clinton.

AUSTIN, MRS. REBECCA MERRITT (Mrs. James Thomas Austin). Botanist; born in Cumberland Co., Kentucky, 10 Mar. 1832, died in Chico, Calif., 14 Mar. 1919. Began her studies of native plants in the area around Quincy, Calif., in 1866; earliest experiments were with *Darlingtonia californica;* owned her first hand lens in 1875; first plant collector in Modoc Co., Calif.; explored Shasta, Tehama, Plumas, and Lassen cos. in Calif. and the southern Cascade Mts. in Ore. Jepson has called her the finest and most outstanding type of pioneer woman botanist in Calif. *Nemophila Austinae, Symphoricarpos Austinae.*

AUSTIN, STAFFORD WALLACE. Business man, lawyer; born in Hilo, T. H., 16 May 1861, died in Los Angeles, Calif., 12 Sept. 1931. Collected plants in Inyo Co., Calif., while County Superintendent of Schools (1895–98), and next as Registrar in U. S. Land Office at Inde-

pendence; identified with the discovery of potash at Trona and was later manager of Los Angeles office of Amer. Potash and Chem. Corp., or its predecessor, 1919–29; practiced law in San Francisco, 1906–09. *Penstemon Austini.*

Bailey, Vernon Orlando. Biologist; born in Manchester, Mich., 21 June 1864, died in Washington, D. C., 20 Apr. 1942. Famous naturalist; member of the Death Valley Expedition, 1890–91; one time chief field naturalist of U. S. Biol. Surv. under C. Hart Merriam: author of many valuable scientific works. *Campanula Baileyi.*

Baker, Milo Samuel. Educator, botanist; born in Strawberry Point, Iowa, 19 July 1868, now resides near Kenwood, Sonoma Co., Calif. Life-long student of the genus *Viola;* a pioneer explorer of Modoc Co., Calif.; for many years professor of biology in Santa Rosa Junior College; brought to the attention of botanists generally the remarkable Pitkin Marsh, Sonoma Co., Calif. He has been most generous in supplying specimens to specialists and has donated many specimens, including isotypes of new taxa based on his collections, to the Calif. Acad. Sci. and other institutions. *Arctostaphylos Bakeri.*

Barneby, Rupert Charles. Amateur botanist; born in Abergavenny, Monmouth, England, 6 Oct. 1911, now a resident of Wappingers Falls, N. Y. Most of his collections have been made with (Harry) Dwight Ripley (born in London, England, 23 Oct. 1908). Together they have specialized in floristic studies of desert and semidesert areas in Europe, northern Africa, and North America where they have re-collected many rare plants and discovered a number of new ones. They have most generously given Calif. Acad. Sci. specimens of their American collections. Mr. Barneby is well known for his scholarly studies in the vast and difficult genus *Astragalus. Castilleja Barnebyana.*

Berry, Seneca Lucien. Engineer; born in Mt. Vernon, Ind., 1 June 1869, died in Sunnyvale, Calif., 16 Mar. 1923. Mr. Berry, Pierson Durbrow, and Benjamin Brooks were Alice Eastwood's companions in 1899 when they explored the South Fork of Kings River and Bubbs Creek, proceeding as far as Harrison and Kearsarge passes. In 1901 with Dr. Kasper Pischel and Carlos Hittell, he assisted her on a pioneer-botanical exploration of the Trinity Alps region which the party entered by Canyon Creek. Miss Eastwood records the fact that "without his assistance the trip to this inaccessible region would have been unsuccessful." *Convolvulus Berryi, Penstemon Berryi, Polemonium Berryi.*

Bioletti, Dr. Frederic Theodore. Viticulturist; born in Liverpool, England, 21 July 1865, died in Redwood City, Calif., 12 Sept. 1939. Graduate of Univ. Calif., Berkeley, where he studied under Edward L. Greene, whom he greatly admired; Prof. of Viticulture, College of Agriculture, Univ. Calif., specializing in grapes and olives; world authority on wine; helped build the Calif. wine industry; contributor to L. H. Bailey's Standard Cyclopedia of Horticulture. *Mimulus Bioletti.*

Blaisdell, Dr. Frank Ellsworth. Physician, entomologist, "able naturalist"; born in Pittsfield, N. H., 13 Mar. 1862, died in Watsonville, Calif., 6 July 1946. An enthusiastic collector of native plants who gave many specimens to the Calif. Acad. Herbarium, including a valuable Alaskan collection; Professor of Surgery, Stanford University, at the time of his retirement in 1927; Research Associate in Entomology Dept., Calif. Acad. Sci., where he gave his very important collection of *Coleoptera. Cardamine Blaisdellii, Delphinium Blaisdellii, Lupinus Blaisdellii.*

Blochman, Mrs. Ida May Twitchell (Mrs. Lazar E. Blochman). Educator; born in Bangor, Me., 11 Apr. 1854, died in Berkeley, Calif., 1 Aug. 1931. Eighteen years a teacher in the Santa Maria Valley, Calif., where she did much to make known the plants of that region; became a resident of Berkeley in 1909 and conducted weekly classes in botany at the College Women's Club; once a member of the Berkeley Board of Education. *Sedum Blochmanae, Sphacele Blochmanae.*

Bowman, Frances Agnes. School teacher; born in Shanghai, China, 22 Aug. 1873, died in San Francisco, Calif., 16 Apr. 1931. Came to San Francisco when one year old and was educated there; graduated from Stanford University in 1896 where she majored in botany; her interest in botany, and in a beautiful garden, continued through many years while she taught school in San Francisco; at one time she assisted Alice Eastwood in the herbarium, donating her services. Both she and her mother, Mary C. Bowman, were charter members of the Calif. Bot. Club and both brought many specimens to the Academy. *Navarretia Bowmanae.*

Brandegee, Mrs. Katharine (Mary Katharine Layne, Dr. M. K. Curran, Mrs. T. S. Brandegee). Botanist; born in w. Tenn., 28 Oct. 1844, died in Berkeley, Calif., 3 Apr. 1920. Spent childhood in Sierra Nevada foothills, Eldorado Co., Calif.; married Hugh Curran who died when she was 30; then began study of medicine, graduating from Univ. Calif. in 1878; began study and collection of plants at Calif. Acad. Sci. in 1882 and gave up her small practice to become Curator of Botany there in 1883, the next decade spent in that service; married T. S. Brandegee in San Diego in 1889 and walked with him to San Francisco, botanizing all the way; founded biological publication Zoe that was financed by her husband; organized and led the Calif. Bot. Club in 1891; persuaded Alice Eastwood to join the Academy staff as joint Curator of Botany in 1892, leaving the entire curatorship to Miss Eastwood when the Brandegees moved to San Diego in 1894; during the last 14 years of her life she worked in the Univ. Calif. herbarium at Berkeley, refusing compensation, "content to feel she had contributed her quota toward a better knowledge of the flora of California." A remarkable woman. *Lupinus Layneae.*

Brandegee, Townshend Stith. Civil engineer, botanist; born in Berlin, Conn., "two days after St. Valentine's Day" in 1843, died in Berke-

ley, Calif., 7 Apr. 1925. Surveyed extensively for the railroads, mainly in Colorado, after graduation from Yale; botany at once became his avocation, and in time became his only study and life work; visited Calif. in 1886–87, and thereafter lived there; joined Calif. Acad. Sci. and, at the end of May, 1889, married its Curator of Botany, Mrs. M. K. Curran; charter member of Calif. Bot. Club; appointed Honorary Curator when he and Mrs. Brandegee gave to Univ. Calif. their extremely valuable herbarium and library in 1906; worked in the Berkeley herbarium for the next nineteen years, accepting no compensation. A remarkable man. *Fritillaria Brandegei, Lupinus Brandegei, Nemophila Brandegei, Ribes Brandegei.*

Brooks, Benjamin. Engineer; born in San Francisco, Calif., 26 Nov. 1876, and still a resident of that city. Accompanied Alice Eastwood, together with Pierson Durbrow and Lucien Berry, when she explored the South Fork of Kings River in 1899; the only plants interesting to him were in the form of "good grass and clover for the burros." Mr. Brooks believes Miss Eastwood was the first woman to scale Mt. Stanford. His father, Wm. Brooks, left Brooklyn when four months old and celebrated his first birthday in San Francisco in 1849. *Castilleja Brooksii.*

Brown, H. E. Plant collector. As early as 1890 but not after 1897, Mr. Brown collected plant specimens in the Mt. Shasta-Mt. Eddy region of California and on the Mendocino Co. coast in May and June, 1898. He prepared sets of duplicates for sale that were advertized by a printed list and, according to William Bridge Cooke (Amer. Midl. Nat. 26: 80,—1941), there is a complete set of Brown's plants as well as the printed list at the N. Y. Bot. Gard. Probably many of his collections were determined by Alice Eastwood at the Calif. Acad. Sci. A memorandum in the Jepson Herb. library, Univ. Calif., suggests that Mr. Brown may have been a storekeeper in Mt. Shasta City (Sissons), Calif. Further details are lacking. *Lathyrus Brownii, Orthocarpus Brownii.*

Bruce, Mrs. Charles Clinton (Carola Josephine Austin). Botanist and collector; born in Butterfly Valley near Quincy, Plumas Co., Calif., 24 May 1865, died in Oakland, Calif., 31 Aug. 1931, buried in Chico, Calif. According to her son, Chester Austin Bruce of Chico, Mrs. Bruce's botanical activities were restricted to south central Oregon and to Butte, Plumas, Lassen, and Modoc counties in California where she collected flowers, seeds, roots, and bulbs; dealt with Luther Burbank, Carl Purdy, F. H. Harsford at Charlotte, Vt., Smithsonian Institution, and Royal Botanic Gardens at Kew, England. Plants collected by Mrs. Bruce and named by Miss Eastwood for her and for her and her mother (Rebecca Merritt Austin) are *Cynoglossum Austinae* and *Scutellaria Austinae.*

Campbell, Mrs. Marian Louise (Waldron). Born in Jackson, Mich., 19 Mar. 1865, now residing in Saratoga, Calif. Early member of the Calif. Bot. Club. Following the 1906 fire, when Alice Eastwood re-

turned to Calif. Acad. Sci. to build a new herbarium, Mrs. Campbell, who had recently moved to Calif., volunteered her assistance. During World War I she was employed as mounter in the herbarium. She recalls her elation when specimen No. 1000 had been mounted. And she adds, "to those of us who were there, this early time was a most enthusiastic and delightful period." *Lupinus Campbellae.*

Campbell, Mrs. William Wallace (Elizabeth Ballard). Born in Grand Rapids, Mich., 24 June 1869, now residing in Pasadena, Calif. Prior to his selection as President of Univ. Calif., the late Dr. Campbell was Director of Lick Observatory, Mt. Hamilton, Calif. While residing there, Mrs. Campbell found leisure moments to observe and enjoy the plants of that most interesting region, one of which is the manzanita named by Miss Eastwood. The members of her family rejoice in the fact that she has enjoyed a wonderfully useful and full life. *Arctostaphylos Campbellae.*

Cannon, Evelina. Music teacher, botanical collector. After meeting with success as a music teacher in New York, she moved to San Francisco, becoming a charter member of the Calif. Bot. Club and a very active amateur collector, especially in and around San Francisco. Before the San Francisco Fire she was employed by Miss Eastwood as an assistant in the Calif. Acad. Sci. herbarium. Her valuable herbarium was the first to be donated to the Academy after the fire. Miss Cannon having died a few years before, the gift was from Miss Carrington, her niece. Further details are lacking. *Helianthella Cannonae.*

Cantelow, Mrs. Herbert Clair (Ella Dales Miles). Amateur collector and long-time member of Calif. Bot. Club; born in San Francisco, Calif., 12 Sept. 1875, now residing in Berkeley, Calif. Long an enthusiastic collector of native plants; was made a life member of the Calif. Acad. Sci. in 1942 in appreciation of plants collected in Ariz., Nev., Wyo., Utah, Idaho, and Colo., and given to the herbarium; donated her private herbarium to the Academy in 1947. *Lupinus Dalesae.*

Clemens, Mrs. Mary Strong (wife of Rev. Joseph Clemens). Botanical collector; born in Cochecton Center, N. Y., 3 Jan. 1873, now residing in Brisbane, Australia. Her earliest collections were made in Colo., Wyo., Mont., Utah, and Calif.; later, collected extensively in Philippines, Borneo, Australia, New Guinea, etc.; fearlessly explored the wildest regions, unattended; was collecting in New Guinea when the Japanese invaded that little-known island. All of her earnings from collections and all of her properties have been given to charity. *Castilleja Clementis, Galium Clementis.*

Congdon, Joseph Whipple. Attorney, plant collector; born in Pomfret, Conn., 12 Apr. 1834, died in Waterman, Wash., 5 Apr. 1910. Practiced law in San Francisco, Calif.; collected extensively, particularly in Sonoma and Mariposa cos., Calif. His private herbarium is now at Univ. of Minnesota. *Garrya Congdoni, Nemophila Congdoni, Sedum Congdoni.*

COOMBS, MRS. A. L. A friend or possibly only a botanical correspondent of Alice Eastwood. Miss Eastwood recounted that Mrs. Coombs accompanied her husband on fishing trips and occupied her time collecting plants while he angled. That the Coombs-Eastwood correspondence extended from before the San Francisco Fire until after the Calif. Acad. Sci. was reëstablished may be judged from the citation of a Coombs collection from Baird, Shasta Co., Calif., under *Scutellaria Austinae* in 1903 (Bull. Torr. Bot. Club 30: 494) and from the Coombs collection with which we deal here made on the Williamson River, Ore., in 1913. Further details are lacking. *Streptanthus Coombsae.*

COPELAND, DR. EDWIN BINGHAM. Botanist; born in Monroe, Wis., 30 Sept. 1873, now a resident of Berkeley, Calif. Graduate of Stanford Univ. with pioneer class of 1895; botanist of U. S. Philippine Commission, 1903; Curator of Herbarium, Univ. Calif., Berkeley, 1928-32; world authority on ferns and author of Genera Filicum. *Erigeron Copelandi, Gentiana Copelandi, Orthocarpus Copelandi, Veronica Copelandi, Vicia Copelandi.*

COVILLE, DR. FREDERICK VERNON. Botanist; born in Preston, N. Y., 23 Mar. 1867, died in Washington, D. C., 9 Jan. 1937. Taught botany at Cornell, 1887–88; botanist U. S. Dept. Agriculture, 1888–93; Curator, U. S. National Herbarium, 1893–1937; botanist on the Death Valley Expedition and author of its famous Botany; joint author of Standardized Plant Names; awarded George Robert White Medal of Honor by Mass. Hort. Society, 1931. *Eriogonum Covilleanum, Salix Covillei.*

CURRAN, DR. M. K. *See* Brandegee, Mrs. Katharine.

CUSHING, SYDNEY BARLOW. Banker, railroad builder; born in Jackson, Amador Co., Calif., 8 Mar. 1856, died in Mill Valley, Calif., 30 Sept. 1909. Took the lead in promoting, building, and operating the Mt. Tamalpais Railroad, sometimes called "the crookedest railroad in the world"; was first president of the owning company. *Arctostaphylos Cushingiana.*

CUSICK, WILLIAM CONKLIN. Farmer, explorer, botanical collector; born in Adams Co., Ill., 21 Feb. 1842, died in Union, Oregon, 7 Oct. 1922. Made famous in botanical world by his collections and feats of exploration, especially in eastern Oregon. Collected in sets of twelve, found purchasers for many of them; sold his private herbarium to Univ. Ore. in 1913. *Crepis Cusickii.*

CUTLER, DR. HUGH CARSON. Botanist; born in Milwaukee, Wis., 8 Sept. 1912, now a resident of St. Louis, Mo. Associated with Bot. Mus. at Harvard, 1941–47; field technician Rubber Development Corp. in Brazil, 1943–45; Curator of Economic Botany, Chicago Nat. Hist. Mus., 1947; presently Associate Director, Missouri Bot. Gard., St. Louis, Mo. Has contributed articles on taxonomy and economic botany to technical journals. *Lupinus Cutleri.*

DAILEY, ANNA E. In the summer of 1896, less than four years after Miss Eastwood "came to California to stay," Miss Dailey collected an interesting *Aquilegia* at Evergreen, on Bear Creek, Colo. She had "noted it growing there for several years," and sent it to Miss Eastwood for identification. Biographical details are lacking. *Aquilegia caerulea* var. *Daileyae.*

DUDLEY, CHESTER DAVID. Cattleman, amateur botanical collector. Born in Humboldt Co., Calif., 10 Sept. 1868, died in Turlock, Calif., 4 Aug. 1947. An enthusiastic collector of our native flora who donated many appreciated specimens to Calif. Acad. Sci. His botanical library was given to the Academy by Mrs. Dudley after his death. *Malvastrum Dudleyi, Streptanthus Dudleyi.*

DURAN, VICTOR (GERSHON). Photographer, amateur botanist; born in London, England, 31 Mar. 1897, now residing in Berkeley, Calif. Best known botanically for his collections from the east side of the Sierra Nevada and from the White Mts.; Alice Eastwood has recorded the fact that his specimens were always good and from localities where but little collecting had been done; at present, Biological Photographer, Univ. Calif., Berkeley. *Lupinus Durani.*

DURBROW, MR. AND MRS. PIERSON. He was born in San Francisco, Calif., 16 Jan. 1867, died in San Francisco, 11 July 1948, an insurance broker. She was born Elizabeth Dodge in San Francisco, 9 Nov. 1866, died in San Francisco, 9 Oct. 1948. He, with Benjamin Brooks and S. L. Berry, accompanied Alice Eastwood on her pioneer botanical exploration of South Fork of Kings River in 1899. Both were life-long lovers of native and exotic flowers. *Aster Durbrowi* (named in his honor), *Vicia Durbrowi* (named in their honor).

EVERMANN, DR. BARTON WARREN. Ichthyologist; born in Albia, Iowa, 24 Oct. 1853, died in Berkeley, Calif., 27 Sept. 1932. World authority on fishes; published many works of great importance on New World fishes; U. S. Bureau of Fisheries, 1888–1914; Director of the Museum, Calif. Acad. Sci., 1914–1932; under his directorship the North American Hall, Steinhart Aquarium, and African Hall were built and fruitful expeditions were completed. *Nemophila Evermanni.*

EWAN, JOSEPH ANDORFER. Botanist, biographer, bibliographer; born in Philadelphia, Pa., 24 Oct. 1909, now Assoc. Prof. Botany, Tulane University, New Orleans, La. Author of "Rocky Mountain Naturalists" and many reviews, monographs, and papers covering a wide range of botanical, historical, and related subjects; has collected widely but chiefly in Calif., Colo., and in S. Amer. *Castilleja Ewani.*

FOLLETT, MR. AND MRS. W. I. Attorneys; he was born in Newark, N. J., 10 Mar. 1901, she was born in Hemet, Calif., 26 July 1902; they now live in Oakland, Calif., and both practice law there and in the San Francisco Bay area. Mr. Follett has for years been Curator of Ichthyology, Calif. Acad. Sci., as an avocation. Both have long been

interested in native flora and have brought interesting material to Univ. Calif. and Calif. Acad. Sci. Mrs. Follett (Evelyn Follett) is now President of Queen's Bench, an organization of women lawyers and judges, dedicated to educational activities. *Valeriana Follettiana.*

GIFFORD, PROF. EDWARD WINSLOW. Anthropologist; born in Oakland, Calif., 14 Aug. 1887, now residing in San Francisco, Calif. Assistant Curator, Dept. of Ornithology, Calif. Acad. Sci., 1904–12; author of "Birds of the Galapagos Islands"; anthropologist at Univ. Calif., Berkeley, Calif., where he is Emeritus Professor. *Asclepias Giffordi.*

GOLDSTEIN, LUTIE DEBORAH. Philanthropist, patron of music, nature lover; born in San Francisco, Calif., 9 June 1866, died in San Francisco, 16 Apr. 1955. Her pioneer father came to San Francisco in 1852; early member of Calif. Bot. Club and one of Alice Eastwood's devoted admirers. *Lathyrus Goldsteinae.*

GRANT, DR. ADELE LEWIS. Botanist, educator; born in Carpinteria, Calif., 3 July 1881, now residing in Los Angeles, Calif. Instructor in Botany, Cornell Univ., 1920–26; Lecturer, Univ. S. Africa, 1926–30; Asst. Prof., Washington Univ., St. Louis, Mo., 1930–31; many years as lecturer in botany and nature study, Univ. S. Calif., retired there in 1952; now teaching botany part time; author of a monograph on the genus *Mimulus. Mimulus Grantianus.*

GREENE, PROF. EDWARD LEE. Clergyman, professor, botanist, born in Hopkinton, R. I., 20 Aug. 1843, died in Washington, D. C., 10 Nov. 1915. Episcopal minister, 1871–85, in Colo., N. Mex., Calif.; collected extensively, becoming an expert field botanist, in that period; became associated with Univ. Calif., 1885; Prof. of Botany, 1893, and founder of the Dept. of Botany; Prof. of Botany, Catholic Univ. Amer., 1895–; Assoc. in Bot., Smithsonian Institution; strongly influenced the development of systematic botany in America; publisher of Pittonia, founder of Erythea, author of many works and papers; left 4,000 choice books and 100,000 mounted specimens to Notre Dame Univ. *Delphinium Greenei.*

GRINNELL, DR. FORDYCE. Entomologist; born in Pine Ridge, S. Dak., 17 June 1882, died in San Francisco, Calif., 20 July 1943. Earned his degree in entomology at Stanford Univ.; an extensive traveler who once taught English in the Philippines. As a young man, collected and gave to the Calif. Acad. Sci. many valuable Calif. plants. *Hieracium Grinnellii, Penstemon Grinnellii.*

HALEY, DR. GEORGE. Biologist, explorer, teacher; born in Brownfield, Me., 27 Nov. 1870, died in Berkeley, Calif., 1 Apr. 1954. For many years Prof. of Botany and Biology, Univ. San Francisco; taught school in many states, Japan, and Alaska; half of his estate was left to the Univ. San Francisco, the other half has established a memorial endowment for the Calif. Acad. Sci. Botany Dept. Dr. Haley and his

wife are buried on St. Paul Island, where both had taught school and endeared themselves to the Pribilof Aleuts. *Stephanomeria Haleyi.*

HALL, DR. HARVEY MONROE. Botanist; born in Lee Co., Ill., 29 Mar. 1874, died in Washington, D. C., 11 Mar. 1932. Prof. of Botany, Univ. Calif.; later staff member, Carnegie Inst. Washington; one-time member Calif. Acad. Sci. Council; pioneer in experimental taxonomy; authority in *Compositae: Haplopappus, Madieae,* etc. — *Malvastrum Hallii.*

HELLER, DR. AMOS ARTHUR. Botanist, teacher; born on a farm in Montour Co., Pa., 21 Mar. 1867, died in Vacaville, Calif., 18 May 1944. Founder and publisher of journal Muhlenbergia which he printed by hand and which was illustrated with pen and ink drawings by his wife, Emily Gertrude Halbach Heller; collected extensively in Pennsylvania, Texas, and Western States, also in Hawaii and Puerto Rico; came to Calif. to live in Apr. 1902; retired as instructor at Chico High School. About 1913 he sold his herbarium of 10,000 sheets to the Brooklyn Botanic Garden; the Univ. Wash., Seattle, purchased his library and second herbarium after his death. *Malvastrum Helleri, Arctostaphylos Helleri.*

HENDERSON, LOUIS FORNIQUET. Botanist; born in Roxbury, Mass., 17 Sept. 1853, burial services held in Tacoma, Wash., 18 June 1942. An early and important collector in Idaho; original herbarium lost in Univ. Idaho fire but duplicates are in Gray Herb. and elsewhere; once Curator of Botany, Univ. Oregon; did much to further our knowledge of western flora. *Lupinus Hendersoni.*

HICKMAN, JOHN BALE. Teacher, horticulturist; born in Oxford, England, 1848, died in Watsonville, Calif., 4 Feb. 1929. He taught school at Caneros Canyon on the Natividad road in the San Miguel Hills in Monterey Co., Calif., and spent his spare time and vacations searching that area and Monterey Bay area for interesting plants; sent some to Prof. Greene, Univ. Calif., Berkeley, and some to Calif. Acad. Sci. *Allium Hickmani, Potentilla Hickmani.*

HITTELL, CHARLES (CARLOS) JACOB. Artist; born in San Francisco, Calif., 4 Aug. 1861, died in Monterey, Calif., 30 Mar. 1938. With Lucien Berry and Dr. Kasper Pischel, he assisted Alice Eastwood in her botanical pioneering in the Trinity Alps wilderness in 1901. Studied extensively in Germany and France and was a professional painter the rest of his life. *Ribes Hittellianum.*

HOFFMANN, RALPH. Ornithologist, botanist; born in Stockbridge, Mass., 30 Nov. 1870, died on San Miguel Island off Santa Barbara, Calif., July 1932. Author of books on birds of New England, New York, and Pacific States; Director, Santa Barbara Museum of Nat. Hist. at time of death. He was perhaps more intimately connected with the flora of the Santa Barbara Islands, Calif., than any other botanist. *Castilleja Hoffmanni, Gilia Hoffmanni.*

HOWELL, JOHN THOMAS. Botanist; born in Merced, Calif., 6 Nov. 1903, now a resident of San Francisco, Calif. Graduate, Univ. Calif., Berkeley, 1926; botanist at Rancho Santa Ana Botanical Garden before becoming associated with Calif. Acad. Sci. in 1929; Assistant Curator of Botany there, 1930–1949, succeeding Alice Eastwood as Curator, 1949; botanist on Templeton Crocker Expedition to Galapagos Islands, 1932; author of "Marin Flora" and numerous papers; with Alice Eastwood, founder of journal, Leaflets of Western Botany, and present owner and publisher; president of Calif. Bot. Club. *Allium Howellii, Arctostaphylos Howellii, Brodiaea Howellii, Castilleja Howellii, Malvastrum Howellii.*

JARED, DR. LORENZO DOW. Physician, plant collector; born near Abingdon, Ill., 6 Aug. 1832, died in Santa Barbara Co., Calif., 3 Aug. 1909. Pioneer physician and surgeon of San Luis Obispo Co., Calif., where he lived in Estrella from 1883 to 1894; well known for his diligent collection and study of the flora; sent novel specimens to Asa Gray, and later, to California botanists; after many years he compiled a manuscript list of the native plants of that region. *Navarretia Jaredi, Peucedanum Jaredi.*

JASPER, MRS. WILLIAM. It appears that Mrs. Jasper collected in the San Emigdio Canyon, Kern Co., Calif., in May, 1895. She may have been a guest at the San Emigdio Ranch, then owned by the Tevis family. Miss Eastwood collected there in the spring, 1893, according to Carol Green Wilson's biography (pp. 51, 52) and she may have met Mrs. Jasper in that area then. Biographical details are lacking. *Ribes ascendens* var. *Jasperae.*

JEPSON, DR. WILLIS LINN. Botanist, educator; born near Vacaville, Calif., 19 Aug. 1867, died in Berkeley, Calif., 7 Nov. 1946. One of the chief interpreters of Calif. flora; devoted half a century to systematic botany at Univ. Calif., Berkeley; editor of Erythea and author of many scientific books and papers; founder of Calif. Bot. Society and its journal, Madroño. *Arctostaphylos Jepsoni.*

JOHNSON, ANDREW JOHN. Botanist-nurseryman; born in Sunne Warmland, Sweden, 1853, died in Portland, Oregon, 1903. Went to Astoria, Oregon, *via* San Francisco as a young man; established a nursery there, 1890; collected shrubs and trees from many countries; while in the service of the state of Oregon he mapped many of that state's forests; developed a marked interest in native flora. *Nemophila Johnsoni.*

JONES, MARCUS EUGENE. Botanist, explorer, mining consultant; born in Jefferson, Ohio, 25 Apr. 1852, died in San Bernardino, Calif., 3 June 1934. During fifty years he botanized from Washington to central Mexico, on foot, horseback, bicycle, and in later years, in a "model T Ford"; studies began in 1876; resident of Claremont, Calif., after 1923; monographer of N. Amer. *Astragalus;* publisher of Contributions to Western Botany; charter member of Calif. Bot. Club. His excep-

tionally valuable herbarium was purchased by Pomona College. *Cycladenia Jonesii.*

JUSSEL, MARTIN SIMON. Teacher; born near Eagle, Neb., 4 Nov. 1877, now living in Oakland, Calif. Graduate of Univ. Neb., 1910; moved to Calif., 1912; to Oakland, 1922; taught at various times at Lowell, Polytechnic, and Mission High schools in San Francisco, 17 years a teacher at Polytechnic; retired, 1946. Through the years, Mr. Jussel has been an enthusiastic collector of Calif. flora. *Castilleja Jusselii.*

KELLOGG, DR. ALBERT. Botanist, physician; born in New Hartford, Conn., 6 Dec. 1813, died in Alameda, Calif., 31 Mar. 1887. Voyaged to Calif. "around the Horn," arriving in Sacramento, 8 Aug. 1849; removed to San Francisco in time to be one of seven men who founded Calif. Acad. Sci. in Apr., 1853; his personal botanizing began in earnest in Alaska, 1867. None was more intimately associated with Calif. botany in the twenty-year period ending in his death. Many of his papers he illustrated with excellent drawings. *Nemophila Kelloggii.*

KERR, MARK E. Botanical collector; born in Ireland, 1883, died at Pearl Harbor, T. H., 29 Apr. 1950. Long a resident of Independence, Inyo Co., Calif., where he was well known for his active interest in the Boy Scout movement, mountaineering, Indian welfare, natural history, and especially in the native flora. Awarded Distinguished Service Cross, World War I; left Inyo Co. early in World War II to participate in war work in Hawaii, at which time he gave his herbarium to Calif. Acad. Sci. To the end, his chief interest was in native plants. *Lupinus Kerrii.*

KUSCHE, JOHN AUGUST. Natural history collector, particularly in entomology. Born in Germany in 1869, died in San Francisco, Calif., 3 Mar. 1934. Made extensive collections in remote South Pacific and Arctic regions, Alaska, Arizona, Hawaiian Islands, and elsewhere; contributed many valuable specimens to collections at Univ. Calif., Berkeley, Calif. Acad. Sci., and other museums. *Arenaria Kuschei, Castilleja Kuschei, Erigeron Kuschei, Lupinus Kuschei.*

LANSDALE, MRS. PHILIP VAN HORNE (Ethel Shipley Smith). Nature lover, philanthropist, conservationist; born in San Francisco, Calif., 23 Sept. 1871, where she still resides. A lover of beautiful gardens, whether creations of God or of man and active in movements to conserve them; the redwood grove dedicated to her husband and father was one of the first memorial groves to be established. She is one of the many who recognized the worth and ability of Alice Eastwood and became her devoted friend. *Iris Lansdaleana.*

LAYNE, MARY KATHARINE. *See* Brandegee, Mrs. Katharine.

LEMMON, JOHN GILL. Botanist, botanical collector, erstwhile teacher; born in Lima, Mich., 2 Jan. 1832, died in Oakland, Calif., 24 Nov. 1908. Taught in Mich. public schools; escaped death by a narrow margin in the Civil War; in 1866 convalesced in Sierra Valley, Calif.,

after suffering in Andersonville Prison; botanized that area for 8 years and taught briefly in Sierraville; moved to Oakland, Calif., in 1880 and botanized actively from there; made notable early botanical explorations in Ariz., 1880–84, and in the vicinity of Cholame, San Luis Obispo Co., Calif., in the late 1880's; botanist, Calif. State Board of Forestry, 1888–92; his wife, Sara Allen Plummer (born in New Gloucester, Me., in 1836, died in Calif., 16 Jan. 1929), equally zealous in botany, accompanied him on his botanical trips. The Lemmon Herb., rich in early records, now at Univ. Calif., Berkeley. *Oreocarya Lemmoni.*

LESTER, GERTRUDE ELLEN. *See* Rowntree, Mrs. Lester.

MACOUN, JOHN. Canadian naturalist; born in Marlin, County Down, Ireland, 17 Apr. 1831, died in Sidney, B. C., Canada, 18 July 1920. Prof. of Botany and Geology, Albert College, Belleville, Canada, 1868; entered Canadian government service, 1879; botanist to Canadian Geological and Natural History Survey; assistant director of the Survey, 1887; author of several books and numerous scientific papers and reports. *Oreocarya Macouni.*

MCCRACKEN, DR. ISABEL. Entomologist, educator; born in Oakland, Calif., 27 Dec. 1866, died at Stanford Univ., 29 Oct. 1955. Professor of Entomology, Stanford Univ., where she achieved eminence and was highly respected; Research Associate at Calif. Acad. Sci., a specialist in *Hymenoptera;* accompanied Miss Eastwood and Mr. Howell on many of their collecting trips. *Lupinus Isabelianus.*

MCDONALD, CAPT. JAMES MONROE. Capitalist, philanthropist; born in Washington Co., Kentucky, 10 July 1825, died in San Francisco, Calif., 7 June 1907. "At an early age he crossed the plains with the first of the gold seekers to California" (S. F. Chronicle). It was in appreciation of his generosity in making possible the publication of Prof. Edward Lee Greene's book, West American Oaks, that Alice Eastwood named a new species in his honor. He was one of three who gave the Ricksecker collection of *Coleoptera* to Univ. Calif. in 1881. *Arabis McDonaldiana.*

MERRIAM, DR. CLINTON HART. Biologist, author; born in New York, N. Y., 5 Dec. 1855, died in Berkeley, Calif., 19 Mar. 1942. Best known botanically as the one who established the life zone concept in the 1890's; founder and one-time Chief of the U. S. Bureau of Biological Survey; author of many scientific natural history books and papers; founder and member of Board of Trustees, National Geographic Society, 1888; eminent scientist. *Chrysoma Merriami, Heuchera Merriami.*

MEXIA, YNES (Mrs. Augustin A. de Reygadas). Botanical explorer, lecturer; born in Georgetown, Washington, D. C., 24 May 1870, died in Berkeley, Calif., 12 July 1938. Granddaughter of José Antonio Mexia, a Mexican general under Santa Anna; early childhood spent in

Texas where the family owned vast acreage upon which the town of Mexia is now located; resided in San Francisco during last thirty years of her life; began collecting in 1922; explored and collected extensively in Mexico, Brazil, Peru, Ecuador, Bolivia, Argentina, and Chile; made the first general collection in Mt. McKinley Nat. Park, Alaska, in 1928; total collections about 150,000 specimens. *Castilleja Mexiae.*

Milliken, Edward Redington. Attorney; born in Maynard, Mass., 9 July 1881, died in Pasadena, Calif., 27 July 1956. Following his graduation from Pomona College in 1904, he and his classmate, James D. Culbertson, undertook the collection of Sierra Nevada plants at the request of Prof. C. F. Baker; graduated from Stanford Law School in 1908 with degree of J. D.; practiced law in the same suite in Pasadena from 1908 until the time of his death; a confirmed, life-long lover of the High Sierra. *Senecio Millikeni.*

Moffat, David Halliday. Banker, railroad builder; born in Orange Co., N. Y., 22 July 1839, died in New York, N. Y., 18 Mar. 1911. President First National Bank, Denver, Colo., 1880; instrumental in developing Colorado's water and mineral resources and in building several railroads; President, Denver & Rio Grande, 1885; returned to banking, 1891; the 6-mile Moffat Tunnel made possible an all-weather railroad from Denver to Salt Lake City. He extended many courtesies to Alice Eastwood in her early botanizing days. *Penstemon Moffatii.*

Munz, Dr. Philip Alexander. Botanist, educator; born in Saratoga, Wyo., 1 Apr. 1892, now Director, Rancho Santa Ana Botanic Garden, Claremont, Calif. Former Prof. of Botany, Pomona College; Prof. of Botany and Horticulture, Cornell Univ., 1944–46; author of Manual of Southern California Botany; keen student of western plants and authority on New World *Onagraceae. Lupinus Munzii.*

Nelson, Edward William. Naturalist; born in Manchester, N. H., 8 May 1855, died in Washington, D. C., 19 May 1934. Pioneer collector of ethnological data on Bering Straits Eskimo; wrote a treatise on the Eskimo and another on birds of that region; did field work in every state of Mexico, where his contributions were of great importance; over 100 plants and animals have been named in his honor. His was a rarely brilliant career. *Aristolochia Nelsonii, Castilleja Nelsonii.*

Noldeke, Anita Matilda. Plant-lover and active member Calif. Bot. Club; born in San Francisco, Calif., 9 Jan. 1891, now residing in San Francisco. While living in a little-known part of Mono Co., Calif., she collected and sent to the Calif. Acad. Sci. many valuable specimens; now, a volunteer, part-time assistant in the Academy herbarium. *Lupinus Noldekae.*

Palmer, Dr. Edward. Naturalist, botanical explorer; born near Brandon, Norfolk, England, 12 Jan. 1831, died in Washington, D. C., 10 Apr. 1911. Collector of all kinds of natural history specimens; first naturalist to collect on Guadalupe Island off Baja Calif.; explored in

Paraguay, Mexico, sw. U S., and elsewhere; member of the Calif. Bot. Club in 1892 when associated with U. S. Dept. of Agriculture in Washington. *Castilleja Palmeri, Diospyros Palmeri.*

Parish, Samuel Bonsall. Botanist, erstwhile farmer; born in Paterson, N. J., 13 Jan. 1838, died in Berkeley, Calif., 5 June 1928. A pioneer in botanical exploration in southern Calif., much of his early collecting being done with his brother, William Fletcher Parish; botanical expeditions in the 1880's made to Palm Springs, Bear Valley, Palomar Mt. (then called Smith Mt.), and San Jacinto Mts.; the Parish farm on the Santa Ana River between Colton and San Bernardino was a Mecca for botanists, among the botanical visitors being M. S. Bebb, H. de Vries, G. Englemann, A. Gray, C. C. Parry, C. G. Pringle. Parish was an authority on southern Calif. botany, student of *Cactaceae,* charter member of Calif. Botany Club. The Parish herbarium is at Stanford Univ. *Lupinus Parishii, Malvastrum Parishii.*

Payne, Frances Dorris. Teacher; born near Alturas, Modoc Co., Calif., 9 Nov. 1902, now a resident of Alameda, Calif. An ardent collector of wild flowers, particularly in Modoc Co., when opportunity offers; under the direction of W. L. Jepson, she made a critical collection in the Warner Mts., Modoc Co., which she deposited at Univ. Calif. and Calif. Acad. Sci. *Castilleja Payneae.*

Peacock, Mrs. Peter. See Adams, Mary.

Peirson, Frank Warrington. Scholar, botanical collector; born in western New York, 11 Dec. 1865, died in Altadena, Calif., 1 May 1951. Became a resident of Altadena in 1902; assisted by his sister, Mabel, he became a most competent collector in the San Gabriel Range, in Inyo Co., and elsewhere in Calif.; the Peirson herbarium, of about 14,000 sheets, now at Rancho Santa Ana Botanic Garden, Claremont, Calif. Mr. Peirson was a close friend of W. L. Jepson and did many chores botanical and editorial to assist in the publication of the Flora of California. *Castilleja Peirsoni.*

Plaskett, Reason Alpha. Carpenter, one-time botanical collector; born in Cherokee, Tuolumne Co., Calif., 11 Dec. 1852, died in Cambria, Calif., 27 Oct. 1933. Son of Mr. and Mrs. William Lucas Plaskett who settled in Pacific Valley near Gorda, Monterey Co., Calif., in 1868, lived there about thirty years, and raised a family of ten children, including at least six boys. The Plasketts became large landholders in the Santa Lucia Mts. in areas about Jolon and San Antonio and along the coast. When Miss Eastwod botanized there in 1893 and 1897, the Plasketts were her hosts. Her collections were supplemented by Reason Plaskett, who, it appears, began to collect plants and send them to her in December, 1897, continuing this practice until at least April, 1898. His collections in less than five months included at least six new species or varieties. *Linanthus Plaskettii, Nemophila Plaskettii.*

Purdy, Carl (Charlton Elmer Purdy). Plant collector, nurseryman; born in Danville, Mich., 16 Mar. 1861, died east of Ukiah, Calif., 8

Aug. 1945. Because of his great interest in our native lilies, he gave up school teaching, purchased land high in the hills east of Ukiah, Mendocino Co., Calif., and devoted more than fifty years to the collecting, propagating, and sale of lily bulbs and other plants. He made deliveries to every continent. Charter member of Calif. Bot. Club. *Allium Purdyi, Brodiaea Purdyi, Calochortus Purdyi, Fritillaria Purdyi, Iris Purdyi.*

Ritter, Mr. and Mrs. Benjamin Wade. Mr. Ritter was a lawyer and mining man; born in Plainfield, Ind., 6 Feb. 1859, died in Durango, Colo., 18 Nov. 1935. Mrs. Ritter (Jeanette T.) was born in Pleasant Hill, Ohio, 24 Sept. 1857, died in Durango, Colo., 23 Nov. 1920. He gave up his Durango law practice to engage in pioneering mining operations in that area but later resumed law practice there. Mrs. Ritter was an active member of the Durango Library Board for over thirty years. They made it possible for Alice Eastwood to collect in the La Plata Mts. in 1892. *Synthyris Ritteriana.*

Rixford, Gulian Pickering. Journalist, horticulturist; born in East Highgate, Vt., 20 Sept. 1838, died in Palo Alto, Calif., 27 Oct. 1931. Graduate of McGill Univ., Montreal, Canada, in engineering; arrived in Calif. in 1867; managed San Francisco Bulletin for several years; was keenly interested in horticulture and applied entomology and led in the introduction of the Smyrna fig from Asia Minor; Calif. Acad. Sci. Librarian at time of his death; charter member of Calif. Bot. Club. *Eriophyllum Rixfordi.*

Rose, Lewis Samuel. Botanist; born in San Francisco, Calif., 25 Nov. 1893, where he still resides. Graduate of Univ. Calif., Berkeley, 1917; collected and studied algae in Japan, 1917–18 (specimens in Univ. Calif. under name of L. S. Rosenbaum); life member and Fellow of Calif. Acad. Sci.; friend and benefactor to the Academy herbarium to which he has given without remuneration over 25 years of his time and energies, enlarging it and making it more serviceable; since 1930 he has been collecting western American plants and exchanging them on all continents, the specimens received by exchange presented as a gift to the Academy; it is estimated he has given the herbarium over 70,000 specimens, far more than any other donor. *Arctostaphylos Rosei, Castilleja Roseana, Lupinus Rosei.*

Rowntree, Mrs. Lester (Gertrude Ellen Lester). Collector, lecturer, author; born in Penrith, Cumberland, England, 16 Feb. 1879, now residing in Carmel, Calif. Her extensive field work has included every state in the U. S., Canada, and Mexico, done in connection with her wild flower seed business; has distributed seeds to all parts of the world; author of several books and a great many magazine articles; has lectured throughout the U. S.; her private herbarium at Calif. Acad. Sci. *Rosa Lesterae.*

Scupham, Major John Robertson. Civil engineer; born at Rossy Priory, Edinburgh, Scotland, 5 Apr. 1840, died in San Francisco, Calif.,

30 May 1927. Came to Calif. at close of Civil War during which he had served as an engineer officer in the Northern Army; employment by Central Pacific Railroad afforded opportunities for field work in the Sierra Nevada; collected and brought to the Calif. Acad. Sci. many interesting plants from little-explored parts of California; Secretary of Calif. Acad. Sci. during presidency of Dr. Harkness; friend of Mr. and Mrs. Lemmon from whom he purchased specimens. His collections were given to Univ. Calif. after his death. *Ribes Scuphami.*

Shockley, William Hillman. Mining engineer, plant collector; born in New Bedford, Mass., 18 Sept. 1855, died in Los Angeles, Calif., 26 May 1925. Said to be the first botanical explorer to collect in the White Mts. of Calif. and Nev.; duplicates of his 1880–93 specimens were sent to Gray Herbarium; his personal herbarium now at Univ. Calif., Berkeley; charter member of Calif. Bot. Club; father of William Shockley, physicist, Nobel Prize winner in 1956. *Aquilegia Shockleyi, Oreocarya Shockleyi.*

Sinsheimer, Gertrude. Nature lover; born in Vicksburg, Miss., now a resident of San Luis Obispo, Calif. For the last 77 years, a well-known citizen of San Luis Obispo; held Alice Eastwood in the highest esteem and often, through the years, acted as her hostess, sometimes companioning her on botanizing excursions in the San Luis Obispo Co. area. *Sedum Gertrudianum.*

Smith, Leland E. Traveling salesman. When traveling about the country seeking orders for his firm, Mr. Smith developed an interest in the plants he saw and sent specimens to Miss Eastwood. These and other gifts came just as the Academy museum and library were being reëstablished and were much appreciated. Mr. Smith's plant collections appear to have come from northern California and southern Oregon from 1913 to 1915. A thistle he collected at Montague, Siskiyou Co., Calif., in 1913 is the type of *Cirsium Botrys* Petrak. Further biographic details are lacking. *Lupinus Lelandsmithii.*

Tevis, Lloyd Pacheco. Activities various including mining, ranching, and hotel operations; born in San Francisco, Calif., 29 Apr. 1890, now a resident of Carmel, Calif. Grandson of the famous pioneer, Lloyd Tevis, and of Romualdo Pacheco, an early Governor of California. Mr. Tevis recalls being encouraged by Grandfather Tevis to collect wild flowers in the Lake Tahoe region. The day he found the new *Polemonium* he was competing with his brothers for a prize offered by his grandfather. Mr. Tevis maintains a lively interest in wild flowers and fungi. *Polemonium Tevisii.*

Titus, Dr. Frank H. Physician; born in Powellsville, Ohio, in 1851, the son of Dr. Arthur Titus. Graduated from Medical College of the Pacific, San Francisco, Calif., 1876; resident physician at St. Luke's Hospital, San Francisco, 1890–92; Superintendent of San Francisco City and County Hospital, 1894–95; proprietor of a San Francisco phar-

macy, 1896–98; served in the U. S. Army as surgeon in the Philippines, 1898–1902, receiving his honorable discharge 9 Dec. 1902; according to 1905 Official Register of Physicians and Surgeons, "address unknown." *Astragalus Titi.*

Tracy, Joseph Prince. Abstractor of land titles, botanical collector; born in Hydesville, Calif., 11 Jan. 1879, died in Eureka, Calif., 26 Nov. 1953. His field work, mostly in northwestern Calif., extended over the last 50 years of his life; maintained close contact with Univ. Calif., Berkeley, where his personal herbarium will be preserved. *Arctostaphylos Tracyi, Lupinus Tracyi.*

Trask, Mrs. Blanche (Luella Blanche Engles). Botanical explorer; born in Austin, Minn., 26 July 1865, died in San Francisco, Calif., 11 Nov. 1916. Resided on Santa Catalina Is., Calif., 1893–1912; a dauntless explorer who collected in great quantities both botanical and ethnological specimens; her prime collections destroyed in San Francisco's 1906 fire; her private herbarium was lost in the Avalon fire, Nov., 1916. *Aplopappus Traskae, Astragalus Traskae, Cercocarpus Traskae, Eriodictyon Traskae, Gilia Traskae.*

Van Dyke, Mrs. Edwin Cooper (Mary Annie Ames). Occasional collector; born in Rutland, Iowa, 28 Jan. 1872, died in Gadsen, Alabama, 18 May 1940. Through many years she accompanied her husband (physician, Curator of Entomology at Calif. Acad. Sci., Prof. of Entomology at Univ. Calif., Berkeley) on his collecting excursions; she sought plants while he harvested insects. *Lupinus VanDykeae.*

Vollmer, Dr. Albert M. Physician, collector and grower of native lilies; born in San Diego, Calif., 14 May 1896; now residing in San Francisco, Calif. Quoting from Alice Eastwood: "not only has he cultivated most of the lilies of California in his garden, but he has probably seen more growing in their native habitat than anyone." Dr. Vollmer has also collected in Baja California with Dr. I. L. Wiggins of Stanford University. *Lilium Vollmeri.*

Watkins, William Grant. Apiarist, botanist, carpenter; born in Erie, Pa., 17 July 1870, died in Placerville, Calif., 4 Jan. 1944. Moved from Virginia City, Nev., to the present outskirts of Placerville in 1880; first earned his livelihood as a carpenter, but his deep interest in wild flowers and bees persisted from an early age; propagated and distributed widely native bulbs and plants while continuing his study of botany and bee culture; became a leading bee-keeper and in time an authority on honey, bees and their diseases, and the flowers on which they fed; long an active and highly respected member of the Bee-keepers Association; exhibited many kinds of honey and won many prizes at state and county fairs; later became field botanist at the Davis field station, U. S. Dept. of Agriculture, where a major accomplishment was the breeding of bees immune to poisonous plants; rediscoverer of the rare *Arctostaphylos nissenana* (Leafl. West. Bot. 1: 233–4). *Ribes Watkinsi.*

WAY, MRS. ALLAN EUGENE (Catherine Caroline Cooney). Grower of native plants; born in Kamloops, B. C., Canada, 24 June 1869, and still residing there. Her father, Charles Thomas Cooney, came from Ireland to enter the service of the Hudson Bay Co. Mrs. Way reports that there were only a dozen houses in the Hudson Bay Fort at Kamloops when she was born. *Talinum Wayae.*

WESTON, EDWARD ROY. Geological draftsman; born in Dayton, Ohio, 17 Apr. 1885, now residing in San Francisco, Calif. He came to Calif. from Idaho, 1915; his love for the out-of-doors led to the "popular sport of hiking in Marin County," and it was thus that he "had the pleasure and honor of meeting Miss Alice Eastwood." He has been chiefly engaged in map making for the State Mining Bureau, War Department, and many oil companies; still active on a consulting basis; has made excursions to remote spots in Calif. in search of rare plants, sometimes in company with Alice Eastwood. *Calochortus Westoni.*

WETHERILL, BENJAMIN ALFRED. Archaeological explorer; born in Leavenworth, Kan., 25 June 1861, died in Tulsa, Okla., 5 Jan. 1950. "Al" Wetherill was the first white man to sight Cliff Palace in what is now Mesa Verde Nat. Park. Alice Eastwood's extensive, pioneer botanical surveys of that remote general region and adjacent parts of Utah were largely made possible and chiefly conducted under his capable guidance. *Corydalis Wetherillii, Dicoria Wetherillii, Eriogonum Wetherillii, Oreocarya Wetherillii.*

WHILTON, YNEZ YNA (Mrs. Ynez Whilton Winblad). Collector of plants and birds; born in Little Rock, Ark., 6 Oct. 1907, now residing in Los Angeles, Calif. She assisted her father, Emory Whilton, in collecting and mounting wild flowers, birds, and mammals; many of them occupied the walls of his hotel in Tulare, Calif. These specimens are now housed in the Kern County Museum, Bakersfield, Calif. Over 1300 botanical specimens are in Calif. Acad. Sci. where they were sent for determination from 1935 to 1938. *Lupinus Whiltonae, Valeriana Whiltonae.*

WHITNEY, LEO DAVID. Botanist; born in Willits, Calif., 11 May 1908, died in Honolulu, T. H., 7 Nov. 1937. He was a student at the Univ. Calif. in Berkeley, College of Agriculture and Graduate Division, 1931–35; Assistant Agronomist, Hawaii Agricul. Exper. Station at time of death. *Lotus Leonis.*

WINBLAD, MRS. YNEZ WHILTON. *See* Whilton, Ynez Yna.

WOLF, DR. CARL BRANDT. Botanist, rancher; born in Freesoil, Mich., 22 Mar. 1905, now residing in Fillmore, Calif. Graduate of Occidental College, Los Angeles, Calif., 1926; M.A. and Ph.D. at Stanford Univ., 1927 and 1930; botanist, Rancho Santa Ana Botanic Garden, 1930–45; author of many papers on Calif. flora, including revisions of New World *Cupressus* and North American *Rhamnus.*—*Mimulus Wolfi.*

A LIST OF PLANTS FROM DALL AND ANNETTE ISLANDS, ALASKA

BY ALICE EASTWOOD (†)

These plants were collected by Dr. G. Dallas Hanna, curator of the Geology Department of the California Academy of Sciences. He spent about two months in June and July of 1947 in investigations on the natural history of these islands and made collections for several departments of the Academy. The accompanying lists represent the collection of plants. As no plants, so far as I have learned, have ever been recorded from these islands, it has seemed desirable to publish the list. The *Glumiflorae* have been determined by Mr. Howell.

These islands lie in the southern part of the Alexander Archipelago in southeastern Alaska. Dall Island was formerly inhabited only by wild animals — deer, bear, wolves, etc. — but now a cannery and a quarry give employment to many people in the summer. Deep inlets indent the coast, with dense woods on the slopes. Annette Island is an Indian reservation and has an air of civilization with church, schools, and dwellings.

Annette Island

Pinus contorta Dougl.
Juniperus communis L. var. montana Ait.
Triglochin maritima L.
Carex Lyngbyei Hornem.
Carex stygia Fries
Juncus balticus Willd.
Fritillaria camschatcensis (L.) Ker-Gawl.
Maianthemum dilatatum (Howell) Nels. & Macbr.
Streptopus roseus Mx. subsp. curvipes (Vail) Hult.
Aquilegia formosa Fisch.
Ranunculus Bongardi Greene
Ranunculus occidentalis Nutt.
Epilobium latifolium L.
Kalmia polifolia Wang.
Dodecatheon radicatum Greene
Castilleja miniata Dougl.

Dall Island

Adiantum pedatum L. var. aleuticum Rupr.
Elymus hirsutus Presl
Festuca rubra L.
Festuca subulata Trin.
Carex Lyngbyei Hornem.
Scirpus microcarpus Presl
Fritillaria camschatcensis (L.) Ker-Gawl.
Maianthemum dilatatum (Howell) Nels. & Macbr.
Streptopus roseus Mx. subsp. curvipes (Vail) Hult.
Montia parvifolia (Moc.) Greene
Montia sibirica (L.) Howell
Saxifraga Mertensiana Bong.
Tolmiea Menziesii (Pursh) T. & G.
Aruncus sylvester Kostel.
Epilobium Hornemanni Rchb.
Moneses uniflora (L.) Gray
Campanula rotundifolia L.
Prenanthes alata (Hook.) Dietr.

WILD AND DOMESTICATED COTTON PLANTS OF THE WORLD

BY THOMAS H. KEARNEY (†)

Cotton has been grown as a textile plant, in both the Old World and the New, since very early times. Bits of fabric made from cotton have been found in prehistoric ruins in India, and in North and South America. The existing cultivated cottons of the Eastern and the Western hemispheres are very unlike in their botanical characters, and it is nearly impossible to cross them with one another, so there can be no reasonable doubt that their domestication took place independently in the two hemispheres. In this respect cotton is unlike most of the other important agricultural plants. Wheat, barley, oats, rice, flax, hemp, and alfalfa, for example, were first brought under cultivation in the Old World, whereas maize, potatoes, tomatoes, and tobacco were unknown there before the discovery of America.

The genus *Gossypium,* of the Mallow Family, comprises two principal groups of cultivated cottons, the Asiatic-African and the American. With each of these are associated numerous wild or semi-wild forms, many of which have been described as species. Most of these, having seed-hairs of spinnable length, are probably relics of ancient cultivation; but there are also some 16 species with seed-hairs too short to be capable of spinning. These are found in widely scattered areas almost throughout the tropical and subtropical parts of the world, usually in arid situations remote from centers of cotton cultivation. In very few cases do their present distributions overlap, and when they do the two species are seldom, if ever, found growing at the same station. This lintless group is a very heterogeneous one, and most of the species have little in common except the absence of long hairs on the seeds, a shrubby or arborescent habit of growth, and the fact that they are truly wild species, unmodified by human influences.[1]

Seven of these truly wild species are indigenous to the Pacific side of North and South America, two to Australia, three to Africa, and two to southern Arabia and the shores of the Persian

[1] The writer follows, in the main, the classification of the species of *Gossypium* adopted by Hutchinson et al. (9, pp. 1–64).

Gulf. Illustrations of several of the American species were presented in an earlier paper (10). These American wild cottons are: *G. Thurberi,* the most northern and farthest inland, in the mountains of southern Arizona and northern Mexico; *G. Davidsonii,* in Baja California and a small coastal area in Sonora; *G. Harknessii* and *G. Armourianum* on the shores and islands of Baja California; *G. aridum (Erioxylum)* in the states of Sinaloa and Colima, Mexico; *G. Klotzschianum* in the Galápagos Islands off the coast of Ecuador; and *G. Raimondii* in northwestern Peru. There are also two very little-known Mexican species apparently related to *G. Thurberi.*[2]

Especial interest attaches to the Arizona wild cotton *(G. Thurberi)* because this species has been used extensively in recent years in hybridization experiments, in the endeavor to combine its hardiness and resistance to diseases and injurious insects with the desirable properties of cultivated cottons. It is so different from any of the cultivated cottons that Asa Gray, who first described it, made it the type of a separate genus, *Thurberia.* Webber (17) demonstrated, however, that it can be crossed rather readily with two other wild American species, *G. Harknessii* and *G. Armourianum,* and that the hybrids are highly self-fertile. Harland (5,6), Beasley (1), and Stephens (13) crossed an Asiatic cultivated cotton with *G. Thurberi.* The resulting hybrids were sterile, but when treated with colchicine doubling of the chromosomes occurred, and these amphidiploids were female-fertile when crossed, in turn with American cultivated cottons.

Further evidence of the relationship of *G. Thurberi* is the fact that it harbors a race of the very destructive cotton boll-weevil that is almost indistinguishable from the typical insect. When it was proved experimentally that the "Thurberia" weevil could be made to feed on cultivated cotton, the U. S. Department of Agriculture started a campaign of eradication of the wild plant in areas closest to the cotton-growing districts of Arizona, but the cost was found to be prohibitive.

The most local in its distribution of all the American wild lintless species is *G. Armourianum,* which is known only from the small island of San Marcos, in the Gulf of California. Here it

[2] A new arborescent species, *Gossypium lobatum* Gentry, has recently been described from Michoacan, Mexico (Madroño 13: 261,—1956). It is "closely related to *Gossypium aridum.* . . ."—J.T.H.

was first collected by Ivan M. Johnston on the expedition of the California Academy of Sciences to the Gulf of California, in 1921. Dr. Johnston, and also the writer when he first saw it in its native habitat, mistook it for *G. Harknessii.* Subsequently plants were grown by Charles G. Marshall at the former U. S. Acclimatization Garden, at Torrey Pines, California, from seeds of *G. Harknessii* gathered by the writer on Carmen Island, and from seeds from San Marcos Island supplied by Mr. and Mrs. Edward H. Page.

Mr. Marshall noticed that, even in the seedling stage, the two could be distinguished, and when the plants reached maturity it became evident that the San Marcos plant was a very distinct species, although evidently related to *G. Harknessii.* It was my great pleasure to dedicate the new species to Allison V. Armour, whose guest I was during ten delightful days in the Gulf of California. Mr. Armour, who had generously made his yacht available to numerous scientific expeditions, remarked that various animals had been named for him, but this was the first cotton plant to which he had stood as godfather.

The handsomest of all the truly wild cottons of the world is the Australian "desert-rose" *(G. Sturtii).* This plant is unique in the genus in having foliage covered with whitish bloom, like that of a cabbage leaf. Its flowers are of a beautiful lavender-mauve color, with a large crimson spot near the base of each petal. This is an unusual color in the genus, most of the species having yellow, whitish, or rose-red corollas, with or without the petal spot.

Two other species may be mentioned that grow wild on islands in the Pacific Ocean. These are *G. Darwinii* of the Galápagos Islands, discovered by Charles Darwin during the voyage of the *Beagle,* and *G. tomentosum,* the mao cotton of the Hawaiian Islands.

While on the Pinchot Expedition of 1929, Dr. A. K. Fisher collected cotton seeds from the nests of Galápagos ground finches. Plants grown in California from these seeds showed a great diversity of characters, ranging from what seemed to be typical *G. Darwinii* as described by Sir George Watt (16, p. 68) to plants closely resembling the South American group of cultivated cottons known as *G. barbadense* or *G. peruvianum.* All of these plants, however, had short lint hairs on the seed and none resem-

bled the lintless *G. Klotzschianum* of the same island group. *Gossypium tomentosum* is believed to be indigenous to the Hawaiian Islands and, although unquestionably related to the American cultivated cottons, it differs rather markedly from any form now in cultivation and its seed-hairs are scarcely of spinnable length.

During the past 20 years, intensive study of the gentics and cytology of *Gossypium* has thrown much light on the relationships of the species. The discovery was made, almost simultaneously, by Denham in England, Longley in America, and Nikolajeva in Russia, that in the germ cells the basic number of chromosomes is 13 in the Old World and 26 in the New World cultivated cottons. In other words, the former are diploid and the latter are tetraploid. This finding accounted for the previously known facts that it is very difficult to cross an Asiatic with an American cultivated cotton, and that the few hybrids obtained have been highly sterile.

Subsequent investigation, by Skovsted, Webber, and others, showed that all of the wild lintless species which have been studied cytologically are diploid, like the Asiatic cultivated cottons. Skovsted (12) announced later that in the New World cultivated cottons (Upland, Sea Island, etc.) the chromosome complement comprises two sets, 13 larger ones similar to those of the Old World cultivated cottons, and 13 smaller chromosomes resembling those of the American wild lintless species. He concluded that the tetraploid American cultivated cottons have originated from hybrids between two diploid species, one related to the existing Old World cultivated species and the other to one of the lintless wild species of the New World.

Other investigators have found it difficult to confirm Skovsted's observations by direct cytological examination. On the other hand, considerable evidence has accumulated from genetic experiments that his hypothesis is well founded. This evidence was obtained by Harland (5,6), Beasley (1,2), Harland and Atteck (7), Stephens (13,14), Brown (3,4), and others, and was reviewed by Hutchinson, Silow, and Stephens (9, pp. 71–74). Because of their behavior in hybridization experiments, the Old World wild diploid species seem to be excluded as possible ancestors of the American cultivated cottons. Hutchinson, Stephens, and Dodd (8) and Stephens (15) inferred from its greater

compatibility in crosses with Old World cultivated cottons and from the structure of its seed hairs, that the Peruvian *G. Raimondii,* or a related and perhaps now extinct species, is more likely than any of the other extant American wild diploid species to have been the other parent of the original cross.

Assuming that the American cultivated cottons originated in this manner, how are we to account for the contact between an Old World and a New World species necessary to produce a hybrid? As was pointed out at the beginning of this paper, the American cultivated cottons were in existence before (probably long before) 1492. Furthermore, since all of the wild American diploid species inhabit the western rather than the eastern side of North and South America, it seems that migration of the Old World parent species must have been across the Pacific rather than the Atlantic Ocean.

Harland (5, p. 177) who first attacked this problem, suggested the existence of a land bridge across the Pacific, presumably in tropical or subtropical latitudes, during the late Cretaceous or the early Tertiary period. There seems to be little geological evidence in support of this view, and the further objection has been made (9, p. 75) that if a diploid species of *Gossypium* related to the Asiatic cultivated cottons had followed this path of migration, it should have left descendants along its course. But the only cottons now known as growing wild on Pacific islands are the above-mentioned wild, lintless diploid species of the Galápagos Islands and lint-bearing, tetraploid plants evidently related to the American cultivated cottons.

Stephens (16) and Hutchinson, Silow, and Stephens (9, p. 75–80) advanced the idea of the transportation, by prehistoric voyagers across the Pacific, of seeds of a diploid Asiatic, lint-bearing cotton. These are supposed to have been planted somewhere in the neighborhood of a diploid wild American species, with which crossing eventually took place, to give rise to the tetraploid American cultivated cottons. Limitation of space precludes giving their argument in full, but it would seem, if this explanation be accepted, that the origination of the American tetraploid cottons is a much more recent event than Harland supposed it to have been.

A third alternative has been proposed by Stebbins (12, p. 155), who has supposed that the presence of plant fossils of both

Asiatic and American relationship in North American deposits of Eocene age may afford a clue to the mystery. It is true that no remains of cotton plants have been found in such deposits, but in view of the arid nature of the habitats in which the existing wild species occur, failure to find such plants preserved as fossils is perhaps not surprising. Migration of an Asiatic species could have taken place across the northern Pacific when the climate was warmer, by means of land bridges known to have existed. Subsequent movement southward in America, as refrigeration set in, could then have brought about contact with an American diploid species, without human intervention. It may be objected that *G. Raimondii,* the species which seems most likely to have been the American parent of this cross, in its present distribution is the most southern and the most remote from Bering Strait of all the diploid wild cottons of the Western Hemisphere. This, or a closely related species, may, however, have been more widely distributed in the past.

Probably we shall never know how this extraordinary mating came about. Whatever the explanation may be, it has given the world its most valuable cotton plants. These are: the Upland cottons that constitute the bulk of the crop in the United States, the so-called Egyptian cottons that are the principal wealth of the Land of the Nile, and, longest and finest of all cottons, the famous Sea Island, once the pride of South Carolina, but now grown chiefly in the West Indies.

References

1. Beasley, J. O. The origin of the American tetraploid Gossypium species. Amer. Nat. 74: 285–286 (1940).
2. ——. Meiotic chromosome behavior in species, species hybrids, haploids, and induced polyploids of Gossypium. Genetics 27: 25–54 (1942).
3. Brown, Meta S. The spontaneous occurrence of amphidiploidy in species hybrids of Gossypium. Evolution 5: 25–41 (1951).
4. Brown, Meta S., and Margaret Y. Menzel. New trispecies hybrids in cotton. Jour. Heredity 41: 291–295 (1950).
5. Harland, Sidney Cross. The genetics of cotton. London (1939).
6. ——. New polyploids in cotton by the use of colchicine. Trop. Agric., Trinidad 17: 53–54 (1940).
7. Harland, Sidney Cross, and Olga M. Atteck. The genetics of cotton XVIII. Transference of genes from diploid North American wild cottons . . . to tetraploid New World cottons. Jour. Genetics 42: 1–19 (1941).
8. Hutchinson, J. B., S. G. Stephens, and K. S. Dodds. The seed hairs of Gossypium. Ann. Bot. n. ser. 9: 361–367 (1945).

9. Hutchinson, J. B., R. A. Silow, and S. G. Stephens. The evolution of Gossypium and the differentiation of the cultivated cottons. 160 pp. Oxford University Press (1947).
10. Kearney, Thomas H. American wild cottons with thirteen chromosomes. Jour. Heredity 25: 305–312 (1934).
11. Skovsted, A. Cytological studies in cotton II. Two interspecific hybrids between Asiatic and New World Cottons. Jour. Genetics 28: 407–424 (1934).
12. Stebbins, G. Ledyard, Jr. Evidence on rates of evolution from the distribution of existing and fossil plant species. Ecological Monographs 17: 149–158 (1947).
13. Stephens, S. G. Colchicine-produced polyploids in Gossypium I. An autotetraploid Asiatic cotton and certain of its hybrids with wild species. Jour. Genetics 44: 272–295 (1942).
14. ——. Phenogenetic evidence for the amphidiploid origin of the New World cottons. Nature 153: 53–54 (1944).
15. ——. Cytogenetics of Gossypium and the problem of origin of the New World cottons. Advances in Genetics 1: 431–442 (1947).
16. Watt, Sir George. The wild and cultivated cotton plants of the world. 406 pp. London (1907).
17. Webber, J. M. Relationships in the genus Gossypium as indicated by cytological data. Jour. Agric. Res. 58: 237–261 (1939).

NEW CARICES FROM THE CANADIAN ROCKY MOUNTAINS

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Procurement of sedges for testing was included in an exploration trip by B. M. Leese and the writer to the Canadian Northwest for the U. S. Department of Agriculture during July and August, 1956, made primarily for the collecting of seed of indigenous grasses and legumes showing promise of forage value. Among the *Carices* collected three species and a variety herein described are apparently new to science and three additional species evidently represent first records from Canada. Herbarium abbreviations are those standardized by Lanjouw and Stafleu in their Index Herbariorum, Part I, 3rd ed. (Regnum Vegetabile 6: 1–224,—1956).

Carex eurystachya F. J. Hermann, spec. nov. (Acutae). Repens rhizomatibus tenuibus verticalibus; culmi graciles 1.5–3 dm. alti folia vix vel dimidio superantes; spicae 3–5, ovoideae vel breviter oblongae, 7–10 mm. longae, 5–10 mm. latae, densiflorae, sessiles vel infima subsessilis brevipedunculata

in capitulum terminale 1.5–2 cm. longum confertae, spica terminalis gynaecandra laterales femineae; squamae atropurpureae costa angustissima vel obsoleta; perigynia biconvexa, ovato-lanceolata, 3–3.5 mm. longa, 1.1–1.3 mm. lata, conspicue stipitata, valde nervosa; achaenia lenticularia obovoidea 0.65 mm. longa, 0.55 mm. lata perigynii dimidium explentia.

Non-cespitose; extensively creeping from slender, vertical rhizomes, generally with sterile branches from the base: culms 1.5–3 dm. high, phyllopodic, slender, triangular, smooth below, more or less scabridulous above, from slightly exceeding to 1½ times the length of the leaves, the dried leaves of the previous year persistent at the base; leaves 2 to 4 to a fertile culm, mostly clustered toward the base, the blades 4–12 cm. long, 0.5–1.5 cm. wide, flat below, channeled to somewhat triangular toward the strongly scabrous, attenuate apex, the midrib prominent on the under surface, scabridulous toward the apex, the sheaths very thin ventrally and soon breaking but not becoming fibrillose, hyaline, generally red-dotted or mottled below, brown to dark reddish-brown at the concave mouth, the ligule as wide as, or wider than, long; spikes 3 or 4 (rarely 5), ovoid to short-oblong, 7–10 (rarely 12) mm. long, 5–7 mm. wide, densely flowered, sessile or the lowermost subsessile to short-peduncled, aggregated into a terminal head 1.5–2 cm. long or the lowermost occasionally separate, the terminal gynaecandrous, clavate at the base, the lateral pistillate, from slightly narrowed to rounded at the base; bracts generally two, the lowermost 3–8 cm. long, exceeding the inflorescence, with short, colored, open sheath; scales oblong-lanceolate, blunt to barely acute, dark purple, not at all hyaline-margined or rarely slightly so at the apex, the midrib very narrow and not extending to the apex or obsolete, the pistillate much shorter and narrower than the perigynia; perigynia ovate-lanceolate, 3–3.5 mm. long; 1.1–1.3 mm. wide, biconvex, ascending to ascending-spreading, the empty, often more or less twisted, tips sometimes reflexed, strongly stipitate (the stipe 0.5 mm. long) and heavily 12–20-nerved, membranaceous, the body smooth and white, the apex minutely granular and green or gold-tinged, tapering to an apiculate, subentire, dark reddish-brown beak less than 0.25 mm. long; achenes lenticular, obovoid, 0.65 mm. long, 0.55 mm. wide, brown, shallowly-minutely pitted, sessile, abruptly long-apiculate, jointed with the style, filling the lower half of the perigynium; stigmas 2, short, reddish-brown.

ALBERTA: forming extensive beds on clay-gravel outwash plain on south shore of Cavell Lake, alt. 5620 ft., northeast slope of Mt. Edith Cavell, 14 miles south of Jasper, Jasper National Park, Aug. 28, 1956, *Hermann 13529* (ALTA, CAN, CAS, NA, US, type).

Nearest allied to *Carex Hindsii* C. B. Clarke of meadows of the West Coast in its conspicuously stipitate, strongly nerved perigynia, *C. eurystachya,* with its non-cespitose culms, vertical rhizomes, congested inflorescence, and short, thick, sessile or subsessile spikes, the terminal gynaecandrous rather than staminate, is strikingly different from that and other related species in

habit. Additional distinguishing characteristics are the narrower, almost smooth perigynia, achenes only half as large and filling only the lower half of the perigynium, and the darker pistillate scales with very narrow or obsolete midrib and without hyaline margins.

Carex athabascensis F. J. Hermann, spec. nov. (SCIRPINAE). Laxe caespitosa e rhizomatibus validis repentibus; culmi 2.5–4 dm. alti, crassi, rigidi, phyllopodi; folia frondosa 2–4 ad basim culmi aggregata; foliorum ligula longior quam latior; spica feminea lineari-cylindrica, 3.5–4.5 cm. longa, dense 50–120-flora; perigynia 2–2.5 mm. longa, 1.5–1.75 mm. lata, late obovoidea vel suborbicularia, dense hirsuta; achaenia late obovoidea, 1.25 mm. longa, 1–1.25 mm. lata, angulis obsoletis.

Loosely cespitose from stout, woody, fibrillose, creeping rootstocks; culms 2.5–4 dm. high, stout, stiff, triangular, roughened on the angles above, more than twice the length of the leaves, phyllopodic, brownish or slightly reddish-brown-tinged at the base, more or less clothed at the base with the dried-up leaves of the previous year; sterile shoots conspicuous, phyllopodic; leaves with well-developed blades 2 to 4 to a fertile culm, clustered near the base; blades erect or ascending, thick and stiff, green, channeled above, 2–16 cm. long, 1.2–3 mm. wide, the margins very rough toward the attenuate apex; sheaths brown-hyaline and short-pubescent, very thin and early ruptured ventrally, the mouth from shallowly concave to slightly convex, the ligule longer than wide; culms dioecious; pistillate spike solitary, erect, linear-cylindric, 3.5(rarely 2)–4.5 cm. long, 4 (rarely 3)–5 mm. wide, closely 50(30)–120-flowered, the perigynia ascending, in many rows; bract rudimentary or obsolete, 2.5 cm. or less long, inserted somewhat below the base of the spike, its sheath 2–3 mm. long, open, reddish-brown-tinged; pistillate scales ovate, sparsely pubescent, purplish-brown, the margins broadly white-hyaline and ciliate-lacerate towards the blunt apex, broader than and equaling or slightly exceeding the perigynia; perigynia 2–2.25 mm. long, 1.5–1.75 mm. wide, broadly obovoid to suborbicular, obscurely trigonous, somewhat compressed, dirty white below, deep reddish-brown above, copiously hirsute, the hairs yellowish- to reddish-brown toward the apex, membranaceous, 2-ribbed, tapering to the generally short-stipitate base, very abruptly contracted into an entire, dark-tipped beak 0.25 mm. long; achenes nearly filling the perigynium, broadly obovoid, the angles rounded or obsolete, 1.25 mm. long and nearly as wide (1–1.25 mm.), dark grayish-brown, apiculate, abruptly narrowed to the sessile base; stigmas 3, slender, brownish.

ALBERTA: rocky marl shore of Athabaska River above Athabaska Falls, alt. 3800 ft., 20 miles southeast of Jasper, Jasper National Park, Aug. 28, 1956, *Hermann 13498* (ALTA, CAN, NA, US, type).

Resembling a stiff *Carex scirpiformis* Mack. with stouter and longer pistillate spikes, but phyllopodic, with the ligule longer than wide, with short, broad perigynia, and short, scarcely angled achenes which are as wide as long. From the southern, phyl-

lopodic *C. pseudoscirpoidea* Rydb. *C. athabascensis* is set off by the broader perigynium and broad gray-brown, scarcely angled achene, the elongated ligule, fewer (2 to 4 rather than 5 to 10) stem-leaves, and coarse habit.

Carex incondita F. J. Hermann, spec. nov. (OVALES). Dense caespitosa e rhizomatibus fibrillosis brevissimis; culmi 0.6–3.6 dm. alti, erecti, folia multo superantes; folia ad basim culmi aggregata; spicae 4–7, gynaecandrae in capitulum laxum terminale brevi-oblongum vel ovoideum aggregatae perigyniis 10–25 ascendentibus vel plus minusve adpressis; squamae cupreo-brunneae apice marginibusque hyalinis; perigynia crassa, achaenio conspicue distenta 3–3.5 mm. longa, 1.25–1.5 mm. lata, basi marginibusque spongiosa, ventre enervia vel obscure ad basim paucinervia.

Densely cespitose from very short fibrillose rootstocks; culms 0.6–3.6 dm. high, rather slender but stiff, obtusely triangular below, sharply triangular and scabrous on the angles above, deeply striate, erect, two to three times the length of the leaves, brown at the base and conspicuously clothed with the dried-up leaves of the previous year, the lower bladeless; leaves with well-developed blades 2 to 5 to a fertile culm, clustered near the base, the blades flat, yellow-green, stiff, ascending, 3–12 cm. long, 1.5–3 mm. wide, the margins and midrib scabrous toward the attenuate, more or less channeled apex, the sheaths rather tight, ventrally thin and white-hyaline; ligule wider than long or the uppermost occasionally slightly longer than wide; sterile shoots with 3 to 9 similar leaves bunched toward the apex; spikes (2) 4 to 7, aggregated into a short-oblong to ovoid head, 1–1.75 cm. long, (0.5)1–1.25 cm. wide, or the lowermost sometimes slightly separate, the spikes well defined, gynaecandrous, ovoid to oblong, 7–8 mm. long, 3.5–5 mm. wide, rounded to short-clavate at the base, short-pointed to rounded at the apex, the perigynia 10–25, ascending to somewhat appressed, the staminate flowers few; bracts scale-like, the lowermost rarely somewhat separate and awned; scales narrowly ovate, acutish, coppery-brown with hyaline margins widening at the apex, the midvein paler and usually prominent especially toward the somewhat keeled base, nearly as wide below as, but somewhat shorter than, the perigynia, persistent; perigynia thick, shallowly concavo-convex, ovate, conspicuously distended over the achene, 3–3.5 mm. long, 1.25–1.5 (1.75) mm. wide, membranaceous, copper-brown to very dark brown, wing-margined to the rounded base, serrulate to below the middle, the base and margins bordering the achene filled with spongy tissue, lightly nerved dorsally, ventrally nerveless or obscurely few-nerved toward the base, more or less abruptly contracted into a slender, serrulate, terete-tipped beak half the length of the body, the tip short-hyaline, obliquely cut dorsally, very minutely if at all bidentulate; achenes lenticular, elliptic to oblong, 1.5 mm. long, 0.75–0.9 mm. wide, stipitate, apiculate, yellowish-brown; style slender, jointed with the achene; stigmas 2, slender, dark brown.

ALBERTA: dry, grassy island in sedge meadow, 1½ miles south of Ram River, alt. about 5500 ft., 40 miles south of Nordegg, Aug. 15, 1956, *Hermann 13347* (ALTA, CAN, CAS, NA, US, type); gravelly flood plain of McCleod River, alt. about 5200 ft.,

along road to Mountain Park, 4½ miles south of Cadomin, Aug. 26, 1956, *Hermann 13444* (ALTA, CAN, NA). Growing with *C. atrosquama* Mack. at both localities.

Related to the arctic and subarctic *Carex macloviana* Urv., *C. incondita* differs in its thicker, smaller perigynia which are filled with corky tissue on either side of the achene, in its longer, more broadly hyaline-margined scales, and in having the spikes arranged in a much looser, generally elongate-oblong head rather than densely capitate. From the taller (3–10 dm. high) *C. pachystachya* Cham. it is set off by the appressed-ascending, rather than spreading, perigynia which are more clearly distended over the achene and much more finely nerved.

Carex praticola Rydb. var. **subcoriacea** F. J. Hermann, var. nov. A forma typica recedit inflorescentia erecta, spicis ad apicem plus minusve confertis, perigyniis subcoriaceis opacis brunneis rostri apice breviter tereti.

ALBERTA: grassy, gravelly roadside above McCleod River, alt. about 5500 ft., 3 miles northwest of Mountain Park (35 miles east of Jasper), Aug. 26, 1956, *Hermann 13453* (ALTA, CAN, CAS, NA, US, type). WYOMING (U.S.A.): clearing in lodgepole pine woods north of Lower Green River Lake, alt. 8000 ft., Wind River Mountains, 30 miles north of Pinedale, Sublette County, Aug. 21, 1955, *Hermann 12230* (CAS, NA).

Differing from typical *Carex praticola* in its erect inflorescence with the spikes clustered toward the tip, instead of flexuous and moniliform, and in its opaque, subcoriaceous, brown, rather than translucent, membranaceous, green or whitish, perigynia which, though terete-tipped, lack the prolonged tubular beak-tip of the typical form. Transitional forms occur with enough frequency so that these characteristics cannot be considered more than tendencies, yet the extreme of this evidently montane variety is sufficiently distinct to be puzzling, so it seems advisable that it receive nomenclatorial designation.

NEW RECORDS

CAREX LIMNOPHILA F. J. Hermann (Leafl. West. Bot. 8: 28,—1956). ALBERTA: plentiful along canal and south shore of Two Jack Lake, alt. 4800 ft., 4½ miles northeast of Banff, Aug. 12, *Hermann 13284* (ALTA, CAN, CAS, NA, US); wet, grassy bank of Livingstone River, alt. 5700 ft., Livingstone Falls Campsite, Coleman-Kananaskis Highway, 41 miles north of Coleman, Aug. 5, 1956, *Hermann 13122* (ALTA, CAN, NA); edge of spruce-

cottonwoods on mossy bank of McCleod River, alt. about 4500 ft., 3 miles southwest of Mercoal, Aug. 26, 1956, *Hermann 13440* (ALTA, NA). Heretofore known only from the shore of two montane lakes in Wyoming. Although the Banff locality is also lacustrine it is evident from the other two Alberta stations that the species is also riparian.

CAREX PLATYLEPIS Mack. ALBERTA: moist ditch at edge of woods along highway near north shore of Cameron Lake, alt. 5450 ft., Waterton Lakes National Park, Aug. 1, 1956, *Hermann 13041* (ALTA, CAN, NA); grassy, gravel slope along Coleman-Kananaskis Highway, alt. about 4700 ft., Livingstone Range, 4 miles north of Coleman, Aug. 5, 1956, *Hermann 13088* (ALTA, NA). Although sometimes confused with *C. praticola* Rydb., this is a conspicuously coarser plant readily recognized by its leafy culms with broader, spreading leaves, and by its clustered heads and opaque perigynia only 4–4.25 (4.75) mm. long. Mackenzie's report of the species from Montana, Alberta, and British Columbia (N. Amer. Flora 18: 142,—1931) appears to be the result of a typographical error since in his distributional accounts both in North American Flora (l.c.) and in his North American Cariceae (1: 154,—1940), he ascribes it only to the mountains of Wyoming and Idaho.

CAREX GYMNOCLADA Holm. ALBERTA: in deep moss, depression in limestone outcrop along Livingstone River, alt. 5700 ft., Livingstone Falls Campsite, Coleman-Kananaskis Highway, 41 miles north of Coleman, Aug. 6, 1956, *Hermann 13131* (ALTA, CAN, CAS, NA); wet, muddy bottom of dried pond in meadow, 1½ miles south of Ram River, alt. about 5500 ft., 40 miles south of Nordegg, Aug. 15, 1956, *Hermann 13336* (NA). Reported from mountain meadows of Washington, Oregon, Idaho, Colorado, and California by Mackenzie, and subsequently collected at Mirror Lake, Kalso, British Columbia by J. W. Eastham.

WESTERNERS IN THE EAST

BY DWIGHT RIPLEY
Wappingers Falls, New York

Ten miles outside the town of Poughkeepsie, in New York's Hudson Valley, Mr. R. C. Barneby and the writer have for several years been growing uncommon western plants in both a rock garden and a cold greenhouse — though not always with

conspicuous success. The latest count of those still with us is 294 species. On the whole, as cultivators readily admit, it is the alpines that would seem to be the hardest to keep alive, those from the high cold slides of the Rockies being out of the question in this climate. At the moment we are consoling ourselves with three near-alpines collected at about 8000 feet in the San Bernardino Mts. Grown indoors in pots, they are *Arabis Parishii,* a mat of narrow hoary foliage, *Eriogonum Kennedyi* var. *austromontanum,* another mat with yet smaller leaves, densely white-pannose, and scapes somewhat too tall for the plant (it is astonishing how easy this choice little buckwheat has turned out to be: at first glance it looks quite impossible), and *Potentilla argyrocoma,* perhaps the most elegant of all the members of the subgenus *Ivesia,* with beautiful silver "mousetails," common about Bear Lake. Other ivesias that we have had for many years outdoors are *PP. sericoleuca, sabulosa, multifoliolata,* and *Baileyi* var. *setosa.*

From the mountains to the south we have *Monardella macrantha,* that striking labiate with the decumbent stems, round shiny leaves and long tubes of brilliant scarlet that seems to play Oswego Tea (*Monarda didyma*) to the other "little monardas," and *M. nana* var. *arida,* a shrublet with tiny gray leaves and spidery, flesh-colored corollas protruding in rather haphazard fashion from broad bracts of pinkish white. Both these do well in the open during the summer but are not reliably hardy, so a few plants of each are kept under glass, as is also *M. neglecta* from Mount Tamalpais, a more modest member of the genus with violet heads and neat evergreen foliage. San Diego County provides *Salvia Clevelandii* in vivid blue and *Gilia tenuifolia* in crimson. The latter is local about Jacumba, whence we also have *Mimulus aridus,* a diplacus with smallish, pure yellow flowers in contrast to the salmon, buff and reddish tones of its relatives, and the more widely distributed *Astragalus coccineus,* whose dazzling corollas make atonement for the failure of other loco-weeds to respond to culture. The autumn-flowering *Jepsonia Parryi,* formerly considered a saxifrage, is, even as I write this in October, unfurling its little white stars veined with chocolate, while its northern counterpart, *J. heterandra,* rare in the Sierra Nevada, unfurls them with veins of pink. Rock ferns from the Colorado Desert are *Notholaena Parryi* and the less common but more vigorous *N. californica.* Cismontane ferns are

inclined to be unpredictable, but those from the interior seem to prosper, particularly the Texan saxatile species such as *Cheilanthes leucopoda, Notholaena Copelandii,* and the incomparably lovely *Pellaea pulchella,* a tangle of pale blue filigree. Quite different in aspect but full of spiky charm is *P. brachyptera* from California's serpentine, while *Pityrogramma triangularis* var. *pallida* is the whitest of them all, the fronds being covered in meal on the upper as well as the under surface.

Easy to manage under glass are *Ranunculus (Kumlienia) hystriculus* from dripping rocks in the Sierra, *Romanzoffia Suksdorfii, Sedum Purdyi,* and *Isopyrum occidentale.* Less easy, in fact, difficult, are *Senecio Greenei, Delphinium uliginosum,* and *Viola Hallii,* a trio partial to serpentine. *Viola Beckwithii,* with deeply cut leaves and bicolored violets, has flowered outdoors every spring since 1948, growing on a terrace of inhospitable gravel. Before moving eastward, I should like to point out how rewarding it is to raise annuals each year from seed, and California is of course the state where they occur most abundantly. The month of March is a gloomy one in the Hudson Valley, but how pleasant to ignore the rigors without and step into the greenhouse for a while to study a pan of *Mimulus tricolor* in full bloom. Last spring this captive hogwallow sat snugly on the staging surrounded by similar pans of *MM. Palmeri, Fremontii, Congdoni, Kelloggii,* and *angustatus,* the last with fantastically long corolla-tubes rising from tiny huddles of leaves. The rare *Phacelia verna* of Oregon was also present, flanked by *Canbya candida,* that Lilliputian poppy of the Mohave Desert, and *Cardamine Pattersonii,* confined to Saddle Mountain in northwest Oregon and most attractive with its pink crosses and deep-green, glossy little leaves.

When we come to the Great Basin it is a rather different story. Such desirable cushions as *Lepidum nanum, Phlox tumulosa,* and *Leptodactylon caespitosum* must be abandoned by the collector on their lonely high plateaus, for it is madness to attempt their cultivation. Nevada's homesick exiles left here long ago. From Utah we still have *Townsendia minima,* a most distinct species named by Miss Eastwood and endemic to the Bryce Canyon region; *Penstemon utahensis,* bright coral-red with glaucous leaves; *Primula specuicola,* mauve invalid of southern caves, and *Aquilegia micrantha* which often accompanies it; *Draba sub-*

alpina, white and showy; and *Lomatium latilobum* known from a few cliffs on either side of the Utah-Colorado line. Our one surviving specimen was recently removed from the rock garden, where it had been since 1949, and carefully potted. The caudex is very stout, and there are no less than six rosettes of lucent, apple-green leaves with their broad divisions.

Arizona plants seem quite amenable on the whole. The reliquial *Maurandya acerifolia,* cousin of Mexican species, has flowers of yellowish ivory and scalloped, glandular foliage more reminiscent of a cymbalaria's than a maple's. *Erigeron Pringlei,* similarly saxatile, is foolproof. *Penstemon pinifolius,* looking like a scarlet-flowered member of the *Ericopsis* group *(P. linarioides,* etc.) is found also in New Mexico and is incredibly hearty in the open. Rarity in nature — it grows only on a few rocky summits above 5000 feet — apparently does not prevent it from being a durable ornament of many rock gardens, where dozens of lesser beard-tongues have been known to fail miserably. Except for bulbs, *Valeriana arizonica* is the first thing to come into bloom in the greenhouse, starting in January and continuing through February — large, compact heads of softest pink rising just above the leaves. *Polemonium Brandegei,* at least in the form on New Mexico's Sandia Rim, bears flowers of clear, almost golden yellow; so often they are pale as parchment in this species. It is intensely saxatile, and therefore easier to grow in a pot than polemoniums from alpine turf or scree (this is practically a hard and fast rule where chasmophytes are concerned). Sharing the cliffs with it are *Primula Ellisiae,* whose unusual habitat is never commented on by floras, and *Heuchera pulchella* forming enormous cushions of small neat leaves topped by diminutive heads of rose. The genus *Talinum* is well represented in Arizona and New Mexico, the choicest being *T. brevifolium,* with extra-large pink flowers at ground-level, and *T. pulchellum,* a shade more glaucous and slightly smaller flowered. But alas, all talinums seem to have the tedious habit of only expanding their corollas for an hour or so each day, and the gardener has to be unpreoccupied indeed to catch them during their fleeting moment.

The better known *Talinum okanoganense* from Washington shows great tolerance of outdoor conditions, and all in all one cannot deny it is the pearl, in both senses, of the race. *Campan-*

ula Piperi, endemic to the Olympics, has a reputation for difficulty, and in the garden it seems hard to manage. Indoors, however, it ramps unchecked. White-leaved *Synthyris lanuginosa* from the same mountains can be grown under glass, the foliage being so beautiful that one hardly cares whether it blooms or not — and it doesn't very often. This came from seed sent by Mr. Carl English, but our two plants of the closely related *S. Paysonii* were collected in 1947 on a rocky ridge in the Tetons at 9000 feet. The leaves are just as cleft but green, not white; it is rather aloof. Other Wyoming species still around are *Tanacetum capitatum,* a silver mat of great charm, *Ranunculus (Cyrtorrhyncha) ranunculinus* with corymbs of tiny yellow flowers and deeply dissected foliage, and a single clump of *Eriogonum flavum* subsp. *crassifolium,* whose many-rosetted dome of broad ashen leaves has successfully come through nine summers and winters.

Lastly, let me mention a plant from the Texas limestone: *Laphamia rotundata,* confined to escarpments west of San Antonio. Laphamias have always intrigued us, since they are exclusively cliff-dwellers and tend to remind us of the rich saxatile flora of the Mediterranean where we spent many years collecting. Small shrubby composites, they bloom with few exceptions in the fall. Their flowers are modest, with yellow (rarely white) rays, and the leaves are of varied design but always proportionate to the neat capitula. Last summer *Laphamia rotundata* produced in the greenhouse a bigeneric hybrid with *Perityle coronopifolia* of Arizona and New Mexico, a white-flowered suffrutescent species to be seen, for instance, on stark rock walls high in the Chiricahua Mts. The hybrid plants have cream-colored rays and foliage midway between the coarsely toothed leaves of the *Laphamia* and the finely shredded ones of the *Perityle.* Apparently in the East some Westerners do things they don't (or can't) do at home.

NEW LIGHT ON A LOCAL EUCALYPTUS HYBRID

BY ERIC WALTHER

When our "Key to the species of Eucalyptus grown in California" was published in 1928[1] we devoted several pages of an

[1] Proc. Calif. Acad. Sci., ser. 4, vol. 17, no. 3, pp. 67–87.

appendix to a local eucalypt that was growing in Golden Gate Park, San Francisco, that had puzzled us. This agreed so well with A. Kinney's *E. Mortoniana*[2] that was described from southern California that we were strongly inclined to retain this name. At that time nothing like this tree was on record from Australia. The idea that it might be a hybrid of local origin, while obvious, could not then be decided with certainty. Since then our original tree fell and had to be disposed of, but not before numerous seedlings could be raised. These were very uniform and agreed remarkably with young plants of *E. globulus* Labill. in shape and size of the juvenile leaves, but their pulverulence was much less pronounced. On several occasions, while visiting Santa Barbara, we were shown very similar trees, of unknown origin, which to us at least appeared to be identical.

W. F. Blakeley,[3] under No. 257, treats *E. Mortoniana* as a reputed hybrid of *E. Maideni* F. Muell. and *E. pseudo-globulus* Naudin, of which possible parents only the first mentioned was grown here. Under his No. 255, Blakeley treats *E. unialata* Baker & Smith[4] and, on the same page under his No. 255, he refers to remarks, description, and illustration in Maiden. Here Maiden[5] may be quoted: "This form I have found only in plantations of *E. viminalis* growing with *E. globulus*. I take it to be a hybrid." Maiden's localities are given as Government Domain at Hobart and the Mt. Nelson Range, both in Tasmania.

Our interest in the matter was renewed when we were brought material, undoubtedly of this hybrid, for identification, long after our original large tree had disappeared. Personal investigation revealed that the young tree in question was one of numerous volunteer seedlings that had sprung up under a specimen of *E. viminalis* Labill. Less than 100 feet away was growing a large tree of *E. globulus,* so that no doubt could remain as to the origin of this hybrid. Since the name *E. Mortoniana* antedates *E. unialata* by 17 years, the former designation needs to be retained.

Over 28 years have elapsed since our first meeting with this little problem, and we take pleasure in presenting what appears to be its final solution.

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[2] A. Kinney. Eucalyptus, p. 193 (1895).
[3] A Key to the Eucalypts, p. 155 (1934).
[4] Papers and Proceedings Royal Society, Tasmania, p. 177 (1912).
[5] J. H. Maiden. Critical Revision of the Genus Eucalyptus, part 51, p. 9 (1922).

PUGILLUS ASTRAGALORUM XX: NOTES ON A. MULFORDAE AND SOME CLOSE RELATIVES

BY R. C. BARNEBY
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To the casual or credulous reader Rybderg's disposition of *Astragalus Mulfordae* Jones (in Bull. Torr. Club 40: 51,—1913; N. Amer. Fl. 24: 415, -1929; and Amer. Jour. Bot. 17: 232, Pl. XVII, fig. W,—1930) as the one North American member of the Old World genus *Onix,* the species must appear widely isolated in our flora. *Onix* Medik was based on *A. galegiformis* L., a Caucasian species differing greatly in habit of growth, form of flowers, ample thin-textured foliage, and other details, and only resembling *A. Mulfordae* in the structure of the pod. Included by Bunge in his sect. *Diplotheca,* which contained a number of diverse elements, *A. galegiformis* is recognized by Gontscharov (in Fl. U. R. S. S. 12: 25,—1946) as representing a monotypic section. There is no evidence that it is related to *A. Mulfordae* and the similarities in the fruiting structures are to be attributed to convergent evolution. On the other hand little doubt exists that Jones (Rev. Astrag. 263,—1923) was correct in placing *A. Mulfordae* next to *A. misellus* Wats. (or *A. Howellii* var. *misellus* (Wats.) Jones). These are alike in every essential particular except for the attachment of the stipules, the lower ones being connate-amplexicaul in *A. Mulfordae* and free in *A. misellus.* Connate stipules are generally conceded to be of systematic importance in *Astragalus,* but there are striking exceptions, such as *A. Drummondii* Dougl., where the stipules are free in some populations and connate in others, so that the value of this character is not absolute, but must be assessed independently in each case where it may arise and be employed chiefly as confirmatory evidence of a relationship expressed in a general congruence of other organs. In this case connate stipules provide no more than a good specific character.

The two species described below, *A. oniciformis* and *A. Johannis-Howellii,* are of particular interest in that they form bridges, through *A. Mulfordae,* to which both are closely related, linking two groups of species between which no close relationship has hitherto been suspected. Thus *A. oniciformis* combines nearly every feature of *A. Mulfordae* with the free stipules of *A. misel-*

lus, thereby confirming Jones's disposition of the former; whereas *A. Johannis-Howellii* provides a clear passage towards the formerly isolated and more strongly modified *A. Peckii* Piper, *A. lentiformis* Gray, and *A. Lemmoni* Gray.

All of the species mentioned have very small loosely racemose white or ochroleucous (sometimes purple-veined) flowers with more or less dimorphic wing-petals (the left one much more strongly and abruptly incurved than the right), and deflexed, strigulose, bilocular pods varying from stipitate to sessile and from sharply triquetrous with three almost equally broad faces to compressed-triquetrous, when the dorsal face becomes much narrower than the lateral ones. Most of them are distinguished by their extremely narrow, often mutually exclusive areas of dispersal and all are endemic to the intermountain region, from the south edge of the Columbia Basin and western half of the Snake River Plains south along the eastern foot of the Sierra-Cascade Range to east-central California. The following key pretends to distinguish only those species directly concerned with *A. Mulfordae* and the taxa newly described. Others closely related, but not directly involved in the present problem, are *A. straturensis* Jones (with bright purple flowers, of southwest Utah and adjoining Nevada), *A. toquimanus* Barneby (with glabrous pod, of central Nevada), *A. Howellii* Gray and *A. Arthuri* Jones (much larger-flowered, of northeast Oregon and adjacent Idaho and Washington), and probably *A. carminis* Barneby (purple-flowered and of Coahuila).

KEY TO ASTRAGALUS MULFORDAE AND RELATED SPECIES

1. Stipules all, or at least those at the lower nodes, connate opposite the petiole into an amplexicaul sheath.
   2. Pod triquetrously compressed, stipitate (the stipe 0.5–5 mm. long), the dorsal face openly sulcate, little or no narrower than the lateral faces; leaflets (13) 15–25.
      3. Stipules dimorphic, the upper ones semiamplexicaul, free, only the lowest connate; banner 6.2–8.1 mm. and keel 4.7–5 mm. long; stipe of the pod 3–5 mm. long, the body (9) 10–16 mm. long; leaves (2.5) 5–10.5 cm. long, the leaflets linear or linear-filiform, the terminal one of most upper leaves confluent with the rachis; axis of the raceme (2) 3–10 cm. long in fruit; ovules 11–16; local in Ada and Washington counties, Idaho, and immediately adjoining Malheur County, Oregon, elevation 2200–2750 ft. ..... *A. Mulfordae*
      3. Stipules all connate, the uppermost ones a little more shortly so than the lowest; banner 5–5.5 mm., keel 3.5–3.9 mm. long; stipe of the pod

0.5–2.5 mm., the body 7–10.5 mm. long; leaves 4–6 cm. long, the oblong-oblanceolate or narrowly obovate leaflets all jointed to the rachis; raceme-axis 1.5–4 cm. long in fruit; ovules 6–11; Mono County, California, elevation about 7000 ft....*A. Johannis-Howellii*

2. Pod laterally compressed-triquetrous, sessile or subsessile, the narrowly sulcate dorsal face much narrower than the lateral faces; leaflets 7–15.
   4. Stipules subhomomorphic, all connate; herbage loosely stigulose; leaf-rachis stiff, persistent, running out into a filiform or slightly enlarged and hooked appendage representing the terminal leaflet, the leaves thus paripinnate; seeds about 1.5 mm. long; Deschutes, Klamath, and Crook counties, Oregon.....*A. Peckii*
   4. Stipules dimorphic, the lowest connate, the upper ones free; herbage villosulous; leaf-rachis flaccid, the terminal leaflet jointed like the lateral ones, the leaves imparipinnate; seeds about 2.6 mm. long; s. Plumas and adjacent Sierra counties, California..*A. lentiformis*

1. Stipules all free, the lowest sometimes fully amplexicaul but not united opposite the petiole.
   5. Diffuse or ascending xerophytic plants of dry sandy flats and hillsides (of central transmontane Oregon, se. Washington and sw. Idaho); flowers a little larger than the next, the keel 4–6.4 mm. long; peduncles solitary in the axils; pod stipitate, the stipe (1.5) 2–5 mm. long.
      6. Leaflets (13) 17–25 (27); peduncles 0.5–2.5 cm. long; banner 5.3–6.8 mm. long; body of the pod 6–12 mm. long; seeds 1.5–1.8 mm. long; local in the foothills of the Sawtooth Mts. in Blaine County, Idaho.. .....*A. oniciformis*
      6. Leaflets (7) 11–21; peduncles (1.5) 2.5–7 (10) cm. long; banner 7–10 mm. long; body of the pod 12–25 mm. long; ovules 11–17; seeds 2.2–2.7 mm. long; Oregon (w. Grant to Crook and Deschutes counties) and north to the Yakima River, Washington.....*A. misellus*
   5. Prostrate mesophytic plants of lake-shores and moist stream-banks (from the head of Deschutes River, central Oregon, s. along the foot of the Cascades and Sierra to upper Owens Valley, California); flowers minute, the keel 3.4–4 mm. long; peduncles geminate in the upper axils or paired with a branchlet in some lower axils; pod sessile, compressed-triquetrous, 4–7 mm. long.....*A. Lemmoni*

Astragalus oniciformis Barneby, spec. nov., *A. Mulfordae* Jones necnon *A. misello* Wats. affinis et quasi intermedia, illi habitu, foliolis numerosis, pedunculis abbreviatis et legumine breviusculo, huic stipulis inter se liberis acclinis, sed ab utroque iisdem notulis et insuper ovulis paucis (6–12) discedens.

Herba perennis caulescens diffusa gracilis e radice verticali, pilis brevibus incurvis vel adscendentibus subrectis sinuosisque fere undique subcinerea, foliolis supra glabrescentibus; caules numerosi subprostrati e caudice breviter ramuloso emissi (0.5) 1–2.5 dm. longi, basin versus ramuligeri deinde ex axillis omnibus racemigeri; stipulae demum chartaceae triangulari-acuminatae 1.5–4 mm. longae, imae amplexicaules sed inter se liberae, superiores semiamplexicaules; folia 2.5–7.5 cm. longa breviter petiolata, foliolis (6) 8–12 (13)-jugis remotis ellipticis vel oblongis obtusis retusisve conduplicatis 1–6.5

(8) mm. longis, omnibus articulatis; pedunculi 0.5–2.5 cm. longi, folio multo superati; racemi laxissime (4) 6–12-flori, floribus mox nutantibus, axi fructifero 1–7 cm. longo; pedicelli filiformes arcuati vel recurvi 1–1.6 mm. longi cum fructu tarde decidui; calycis 2.9–3.8 mm. longi tubus campanulatus 2.1–2.3 mm. longus, 1.7–2 mm. diametro, dentes subulati 0.8–1.5 mm. longi; petala ochroleuca, vexillo lilacino-striato; vexillum per 90° abrupte recurvum late obovato-cuneatum 5.3–6.8 mm. longum; alae (vexillo parum breviores vel longiores) 5.7–6.8 mm. longae, laminis oblongo-obovatis obtusis 4–4.4 mm. longis, 1.9–2.9 mm. latis, dextra leviter sinistra ulterius abruptiusque incurvis; carina 4–5 mm. longa, laminis semi-circularibus 2.4–3 mm. longis per 110–130° in apicem deltoideum incurvis; legumen pendulum stipitatum, stipite gracili recto (1.5) 2–4 mm. longo, lanceolato- vel oblongo-ellipticum saepissime leviter lunatim incurvum, 7–12 mm. longum, (2) 2.5–3.5 (3.8) mm. latum, utrinque cuneatum vel basi truncatum, apice cuspidatum, triquetrum, sutura ventrali carinatum, faciebus lateralibus planis dorsali aperte sulcata, valvulis chartaceis densiuscule villosulo-strigulosis demum stramineis transverse reticulatis inflexis, septo subcompleto 0.7–1.2 mm. lato; ovula 6–12; semina brunnea nunc purpureo-guttulata laevia sed vix lucida, 1.5–1.8 mm. longa.

IDAHO (all from Blaine County): sandy flats on basalt substratum, elevation 4750 ft., east of Picabo, 21 June 1947, fl. & fr., *Ripley & Barneby 8795*. Type in Herb. Calif. Acad. Sci. No. 338,410. Isotypes IDS, NY, RM, UTC, WTU. Picabo, *Nelson & Macbride 2987* (CAS), *George Wood in 1941* (IDS). 3 miles west of Carey, *R. J. Davis 3088* (IDS).

The cited material has been referred, by the writer as well as by others, to *A. Mulfordae,* to which *A. oniciformis* is more closely related than might appear from the foregoing key, which is based primarily on the stipular attachment. The two are, in fact, disturbingly alike in general facies, both having numerous (mostly 17–25) small remote leaflets and short peduncles (0.5–2.5 cm. long), and in these respects they differ together from *A. misellus.* There are numerous small differences. The vesture of *A. oniciformis* is more copious and composed of more loosely appressed often largely sinuous hairs; the petals are ochroleucous veined with dull lilac rather than white; the leaflets are a trifle broader and the terminal one is articulate in all the leaves; the body of the pod is shorter (6–12 mm. as opposed to 10–16 mm. long), the ovules fewer (6–12 as opposed to 12–16) and the seeds smaller (1.5–1.8 mm. as opposed to 2.2–2.6 mm. long). The present species is locally plentiful but apparently confined to the foothills of the Sawtooth Mountains at elevations of about 4750 to 4900 feet, whereas *A. Mulfordae* is known only from river-bluffs be-

tween 2200 and 2750 feet elevation along the Snake and its immediate affluents in Ada and Washington counties, Idaho, whence it extends just across the Oregon line near the mouth of the Owyhee River. Their ranges, as known at present, are separated by a gap of over one hundred miles.

Astragalus **Johannis-Howellii** Barneby, spec. nov., *A. Mulfordae* Jones necnon *A. oniciformi* Barneby (supra descripto) affinis, illius ob stipulas connatas proxima sed ab eo floribus paulo minoribus, legumine breviori brevius stipitato, ovulis minus numerosis, ab hoc praesertim stipulis omnibus in vaginam amplexicaulem connatis absimilis.

Herba diffusa gracilis caulescens e radice verticali perenni, praeter foliolorum paginam superiorem pilis brevibus subappressis et adscendentibus basifixis undique striguloso-villosula; caules annotini e caudicis suffruticulosi ramulis emissi 1.5–4 dm. longi verosimiliter prostrati inferne ramulosi, infra medium et deinde sursum floriferi; stipulae scariosae 1.5–4 mm. longae imae in vaginam campanulatam breviter bidentatam superiores brevius coadunatae; folia 4–6 cm. longa, breviter petiolata, foliolis (6) 7–11-jugis remotis oblongo-oblanceolatis, -ellipticis vel anguste obovatis obtusis conduplicatis 1.5–6 mm. longis, omnibus articulatis; pedunculi tenuissimi 0.8–2.5 cm. longi folio superati; racemi laxissime 6–12-flori, floribus demum declinatis, axi fructifero 1.5–4 cm. longo; pedicelli filiformes demum arcuati 0.8–1.3 mm. longi, fructiferi persistentes; calycis 2.9–3.8 mm. longi tubus campanulatus 1.6–2 mm. longus, 1.5–1.7 mm. diametro, dentes subulati 1.3–1.8 mm. longi; petala albida immaculata; vexillum per 90° recurvum ovato-cuneatum emarginatum 5–5.5 mm. longum, 3.6–3.8 mm. latum; alae 4.4–5.2 mm. longae, laminis oblongo-ellipticis obtusis 3.4–3.9 mm. longis, dextra leviter sinistra fere per angulum rectum incurvis; carina 3.3–3.9 mm. longa, laminis semi-circularibus 2.1–2.4 mm. longis per 110° in apicem deltoideum abrupte incurvis; legumen pendulum stipitatum, stipite recto gracili 0.5–2.5 mm. longo, lunatim oblongo-ellipticum 7–10.5 mm. longum, 2.5–3 mm. latum, utrinque cuneatim contractum, apice cuspidulatum, triquetrum, sutura ventrali carinatum, faciebus lateralibus planis dorsali aperte sulcata, valvulis chartaceo-membranaceis demum stramineis strigulosis transverse reticulatis inflexis, septo subcompleto circa 1 mm. lato; ovula 6–11; semina brunnea nunc purpureo-guttulata sublucida 1.6–2.4 mm. longa.

California: near Owens River, east of Whitmore Tubs Springs, elevation about 7000 ft., in Long Valley, Mono County, 8 August 1938, fl. & fr., *John Thomas Howell 14383*. Type in Herb. Calif. Acad. Sci. No. 265372. This locality is probably now inundated by Lake Crowley, formed by the dam across Owens River near the south end of Long Valley.

The remarkable little plant described here was at first determined by the writer, reluctantly it is true, as a form of *A. Mulfordae* with short-stipitate pod. Difficulty in separating the two species arose from my failure to separate *A. Mulfordae* from *A.*

oniciformis which exhibit, collectively, most of the characters of *A. Johannis-Howellii.* Once the *oniciformis* element is removed from *A. Mulfordae* and the latter is more narrowly and accurately defined, it becomes a simple matter to distinguish the present species, as shown by the numerous differential charters brought out in the key. Although the ranges of variation in the body and stipe of the pod, in the shape of the leaflets, the size of the flowers and the number of ovules are nearly identical in *A. Johannis-Howellii* and *A. oniciformis* the great difference in the stipules coupled with dramatic geographical isolation at points nearly five hundred miles apart provide an ample basis for separating the two taxa. I suspect that they are not so much directly related as parallel developments from a common but relatively remote ancestor. Probably *A. Johannis-Howellii* is at least as close to *A. lentiformis* and *A. Peckii,* although in both these species the stipe of the pod is suppressed or reduced to a rudiment and the body of the pod has become more strongly compressed laterally.

THE GENUS CENTROSTEGIA, TRIBE ERIOGONEAE

BY GEORGE J. GOODMAN
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In 1856, Dr. Gray described the genus *Centrostegia,* based on a collection made in southern California by George Thurber. In 1870, when Torrey and Gray revised the *Eriogoneae,* the genus was maintained, and a second species, *C. leptoceras,* was newly described. In 1877, Watson revised the genus *Chorizanthe* and included in it three groups previously described as genera. His opening remark was that *Chorizanthe* was "A polymorphous genus. . . ." Indeed it was, containing such elements as *Acanthogonum, Mucronea, Eriogonella,* and the two species of *Centrostegia.* Most authors of western floras have followed Watson's course, and it is understandable, historically, that two species that have been discovered since, and that are referable to *Centrostegia* were both described in *Chorizanthe.*

The delimitation of the four species here considered presents no problem, the taxa being very distinct. The apparent rela-

tionship of the four to the rest of the *Eriogoneae,* however, warrants a word of explanation.

In the following table, the morphological characters of *Centrostegia* are compared with *Chorizanthe,* the genus with which it has been so generally united, and with *Oxytheca* (interpreted here as consisting of *O. dendroidea* and *O. Watsoni,* both of which Miss Stokes, correctly, I think, referred to *Eriogonum,* and excluding *O. caryophylloides, O. emarginata,* and *O. trilobata,* a group which it is thought requires separate treatment).

	CENTROSTEGIA	OXYTHECA	CHORIZANTHE
Pubescence	glandular	glandular	non-glandular
Bract position	alternate	opposite or in 3's	opposite or whorled
Bract shape	trilobed	entire	entire
Involucral tube	elongated	not elongated	elongated
Number of flowers in an involucre	2–6 (sometimes but 1 in one of the species)	several	1
Pedicels	long	long	very short to medium
Perianth	divided	divided	lobed
Cotyledons	circular and accumbent	circular and accumbent	linear and straight

It is evident that *Centrostegia* and *Chorizanthe* have but one of the characters listed in common — the elongated involucral tube. *Centrostegia* agrees in all respects with *Oxytheca* except as to the involucral tube and the shape and position of the bracts. On the basis of these characters almost entirely is *Centrostegia* held generically distinct from *Oxytheca.*

Centrostegia Gray ex Benth. in DC. Prod. 14: 27 (1856); Gray in Torr. Pac. R. R. Rept. 7: 19 (1858); Torrey & Gray, Proc. Am. Acad. 8: 191 (1870); Benth. & Hooker, Gen. Pl. 3: 93 (1880); Dammer in Engler & Prantl, Nat. Pflanzenfam. 3[1]: 13 (1893); Goodding, Bot. Gaz. 37: 53 (1904); Rydb., Fl. Rocky Mts. 229 (1918) and ed. 2 (1923).

Annual desert herbs; dichotomously branching or trichotomous at the first node; leaves basal, oblanceolate, glabrate; stems glandular-pubescent; bracts alternate and 3-lobed, the lobes spine-tipped; involucres sessile or subsessile and with a definite tube, teeth spine-tipped; flowers 2–6 in each involucre (sometimes but one occurring in *C. Thurberi),* pedicellate (pedi-

cels often quite as long as the flowers), perianth cleft to the base, the (very usually) 6 segments similar; stamens 9 (sometimes fewer developing), attached at the base of the perianth; achene trigonous above, styles 3, medium long, capitate; embryo with accumbent, circular cotyledons.

The involucral tube varies in cross section from quadrangular (in *C. Vortriedei)* to pentagonal or essentially circular, but is never triangular.

Type species: *Centrostegia Thurberi* Gray ex Benth.

Key to the Species

Involucres lacking spurs or spines at the base.
- Teeth 5, straight ..... 1. *C. insignis*
- Teeth 4, usually uncinate ..... 2. *C. Vortriedei*

Involucres with spines or spurs at the base.
- Involucre with 6 slender spines at base ..... 3. *C. leptoceras*
- Involucre with 3 conical spurs at base ..... 4. *C. Thurberi*

1. Centrostegia insignis (Curran) Heller, Cat. No. Am. Pl. ed. 3, 97 (1910).

Chorizanthe insignis Curran, Bull. Cal. Acad. 1: 275 (1886), and most subsequent authors.

Oxytheca insignis (Curran) Goodman, Ann. Mo. Bot. Gard. 21: 91 (1934).

Flowers pubescent and commonly 6 in each involucre.

The structure of the involucre, the number of flowers in the involucre, and their appearance all indicate a relationship with *C. leptoceras,* as Mrs. Curran suggested.

Type: Indian Valley, near the Salinas River, Monterey Co., California, June, 1885, *Mary K. Curran.*

Number of collections seen: 8.

Time of flowering: May, June, and July.

Distribution. California: Monterey and San Luis Obispo counties.

2. Centrostegia Vortriedei (T. S. Brandegee) Goodman, Ann. Mo. Bot. Gard. 21: 91 (1934).

Chorizanthe Vortriedei T. S. Brandegee, Zoe 4: 158 (1893), and most subsequent authors.

Flowers 2, glabrous, the lower half yellow, the perianth segments bilobed.

Type: Santa Lucia Mountains, Monterey Co., California, June, 1892, *Wm. Vortriede.*

Number of collections seen: 7.

Time of flowering: May, June, and July.

Distribution. California: Monterey County.

3. Centrostegia leptoceras Gray in Torrey & Gray, Proc. Am. Acad. 8: 192 (1870); Goodding, Bot. Gaz. 37: 53 (1904); Goodman, Ann. Mo. Bot. Gard. 21: 91 (1934).

Chorizanthe leptoceras (Gray) Wats., Proc. Am. Acad. 12: 269 (1877), and most subsequent authors.

Flowers pubescent, as many as 6 in an involucre.

Type: "Plains of San Gabriel," Los Angeles Co., California, *William Lobb.*

Number of collections seen: 20.

Time of flowering: April, May, and June.

Distribution. CALIFORNIA: Los Angeles, Riverside, and San Bernardino counties.

Six sheets of *Parish Bros. 829* have been seen. The month and year vary, and four are indicated as from San Bernardino County. Two are stated to be from San Jacinto Plains, San Diego County. The sheet at the University of California has such a printed label but it has been modified, deleting "San Jacinto," and the county changed to San Bernardino. Perhaps all six sheets are from San Bernardino County.

4. CENTROSTEGIA THURBERI Gray ex Benth. in DC. Prod. 14: 27 (1856); Gray in Torrey, Pac. R. R. Rept. 7: 20, pl. 8 (1858); Dammer in Engler & Prantl, Nat. Pflanzenfam. 3[1]: 12, fig. 5P (1891); Goodman, Ann. Mo. Bot. Gard. 21: 91 (1934).

Chorizanthe Thurberi (Gray) Wats., Proc. Am. Acad. 12: 269 (1877), and most subsequent authors.

Flowers pubescent, 1 or 2 in an involucre.

This species is represented by two varieties, the ranges of which do not overlap.

4a. CENTROSTEGIA THURBERI var. THURBERI.

Centrostegia Thurberi Gray, loc. cit.

Type: Sandy hillsides near San Felipe, San Diego Co., California, May, 1852, *George Thurber.*

Chorizanthe Thurberi var. *cryptantha* Curran, Bull. Cal. Acad. 1: 275 (1886).

Type: Mojave Desert, Lancaster Station, Los Angeles Co., California, July, 1884, *Mary K. Curran.*

Centrostegia cryptantha (Curran) Goodding, Bot. Gaz. 37: 53 (1904).

Number of collections seen: 172. Of these, 137 are from California and 44 from San Bernardino County.

Time of flowering: primarily April, May, and June. Over 40% of all collections seen were collected in May.

Distribution. ARIZONA: Gila, Maricopa, Mojave, Pima, Yavapai, and Yuma counties. CALIFORNIA: Inyo, Kern, Kings, Los Angeles, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura counties. NEVADA: Clark, Lincoln, and Washoe counties. UTAH: Washington County.

A few collections from Arizona and Nevada have not been located as to county.

4b. **Centrostegia Thurberi** var. **macrotheca** (J. T. Howell) Goodman, comb. nov.

Chorizanthe Thurberi var. *macrotheca* J. T. Howell, Leafl. West. Bot. 3: 205 (1943).

Differing from the type variety in having larger conspicuously veined involucres, these being 8–9 mm. long and wide.

Type: Alcalde, western Fresno Co., California, May 9, 1893, *Alice Eastwood.*

Number of collections seen: 3.

Time of flowering: May and June.

Distribution. CALIFORNIA: Fresno and San Benito counties.

OBSERVATIONS ON CALIFORNIA PLANTS—IV

BY ROBERT F. HOOVER
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These notes deal with plants in the relationship of the genus *Allium,* referred in Engler's system of classification to the subfamily *Allioideae* of the family *Liliaceae,* but according to Hutchinson's system belonging to the *Amaryllidaceae.*

TRITELEIA LUGENS Greene. The known geographical distribution of this rare plant has been puzzling. Collections have been made in a coherent small area of the north Coast Ranges in Lake, Sonoma, Napa, and Solano counties; then the species has been reported at two remote localities to the south, one in the San Gabriel Mountains of Los Angeles County, California, and the other on Guadalupe Island, Baja California (Hoover, 1941, p. 87). This "almost incredible" distributional pattern is made more credible by a recent discovery: 1.5 miles north of site of Pinnacles station (about 27 miles from Hollister on road to King City), San Benito County, May 6, 1956, *Hoover 8374.* The plants were locally plentiful on east-facing slopes in the partial shade of oaks.

The flowers, which I had described as "dull yellow" from study of dried specimens, were a bright shade of yellow. Other yellow flowers were abundant on the same slopes, so that the plants of *Triteleia* could very easily have been overlooked except for my special interest in the group. Other occurrences of *T. lugens* between the northern and southern parts of its range, it may be concluded, remain to be discovered.

The nature of the plant's occurrence also has significance with regard to its proper taxonomic status. *Triteleia lugens* has been by various authors reduced to varietal rank under *T. ixioides.* The latter occurs in western Monterey County and northwestern San Benito County. Two varieties of the same species, when occurring in relative geographical proximity, may reasonably be expected to show some evidence of exchange of genes. *Triteleia ixioides* and *T. lugens* are, however, as distinct from each other in San Benito County as in the remainder of their ranges. Aside from the distinctive form of the filaments, *T. lugens* has flowers of smaller average size than those of *T. ixioides,* and the pedicels are shorter, so that the umbel is relatively compact.

Triteleia lugens, with the possible exception of its inadequately known occurrence on Guadalupe Island, inhabits regions of considerable temperature fluctuation with long dry summers. True *T. ixioides,* in contrast, is adapted to the cool coastal climate with frequent summer fogs. In correlation with the difference between their habitats, *T. lugens* flowers at least a month earlier than does *T. ixioides.*

AN INTERSPECIFIC HYBRID IN TRITELEIA. In the Milo district in the Sierra Nevada of Tulare County, *Triteleia scabra* (Greene) Hoover and *T. hyacinthina* (Lindl.) Greene are both abundant. Here, as well as elsewhere, the two species show a difference in habitat preference. *Triteleia hyacinthina* grows in moist depressions or on the lower part of slopes where the soil is retentive of water, whereas *T. scabra* favors higher and drier situations. Nevertheless, the local topography is such that the two are often found close together.

On April 28, 1956, several plants were found in the Milo district which were obviously of hybrid origin *(Hoover 8371).* They were not plentiful but were scattered over a considerable local area. All such plants were found where both the presumed parent species grew very near. Corms were collected, so that in future years it may be possible to report on the sterility or fertility of the hybrid, and the nature of its possible progeny.

The hybrid is compared with its parents in the following table:

T. HYACINTHINA	HYBRID	T. SCABRA
Perianth white, bowl-shaped with ascending segments.	Perianth white, intermediate in shape.	Perianth yellowish, with segments rotate or reflexed from the mouth of the short tube.
Stamens equal, their filaments distant from one another and from the style, deltoid-dilated toward base, not forked or notched at apex.	Stamens alternately long and short, their filaments intermediate in position, deltoid-dilated, usually notched or very shortly forked at apex, or sometimes merely truncate below attachment of anther.	Stamens alternately long and short, their filaments contiguous or nearly so, forming a false tube around the style, gradually and slightly widened toward base, usually conspicuously forked at apex.
Scape scabrous near base, or quite smooth.	Scape varying from moderately scabrous to entirely smooth.	Scape markedly hairy near base.

Aside from its intrinsic interest, the hybrid here reported furnishes confirmatory evidence regarding the circumscription of *Triteleia* as a genus. *Triteleia hyacinthina* is the type of the genus *Hesperoscordum* Lindl., while *T. scabra* has been referred to *Calliprora* Lindl. However, the existence of morphologically intermediate species had already made it clear, even in the absence of evidence from genetics, that *Hesperoscordum* and *Calliprora* should not be held generically distinct from each other or from typical *Triteleia* (Greene, 1886; Hoover, 1941). The hybridization of the two species agrees with the conclusion previously reached on other grounds, that they are congeneric. A parallel instance of hybridization between *T. Bridgesii* (section *Hesperoscordum)* and *T. ixioides* (section *Calliprora)* (Hoover, 1941, p. 76, and 1955, p. 19) leads to the same conclusion.

TRITELEIA LILACINA Greene. Previously I have reduced this rare plant to varietal status as *T. hyacinthina* var. *Greenei* (Hoover, 1941). Recent field observation suggests that Greene, in judging it to be a distinct species, gave better expression to the biological facts.

In an open field about two miles west of Chinese Camp, Tuolumne County, *T. hyacinthina* was found in low places, growing in relatively moist soil, while *T. lilacina* occurred on higher ground in thin dry soil over rocks. The remarkable thing about their occurrence is that there was no mixing of colonies of the two species. The boundary between them was as well defined as if artificially drawn. Although the two entities were immediately adjacent to each other, no apparent hybrids or intergrading forms could be found. The two collections confirming this occurrence, both made April 21, 1956, are *Hoover 8366* for *T. hyacinthina* and *Hoover 8367* for *T. lilacina.*

Triteleia lilacina is very similar to *T. hyacinthina* in aspect, but the following differences were noted in fresh flowers:

Perianth at anthesis bowl-shaped, the segments ascending; no hyaline vesicles in perianth-tube; anthers yellow ..... *T. hyacinthina*

Perianth somewhat pointed at base, the segments subrotate; interior of perianth-tube covered with hyaline vesicles; anthers pale to deep blue.. ..... *T. lilacina*

The difference in color of the anthers was constant at this locality but is not everywhere reliable. In examining a large series of specimens of *T. hyacinthina,* I found that a few speci-

mens from the northern Sierra Nevada had considerable blue color in both the anthers and the perianth.

The perianth of *T. lilacina,* which is white when fresh, becomes markedly tinged with purple in drying. This change in color would account for Greene's original description of the flowers as "lilac-purple."

Brodiaea elegans Hoover var. **australis** Hoover, var. nov. Staminodiis stamina superantibus, purpureo-tinctis, obtusis, margine paulo involuta.

Staminodia longer than the stamens, purple-tinged, obtuse, with slightly involute margin.

Type in California State Polytechnic College herbarium: Terra Bella, Tulare County, California (persistent in uncultivated strip along railway), April 28, 1956, *Hoover 8372.*

The two species of "Harvest Brodiaea," *B. coronaria* and *B. elegans,* are distinct enough over most of their ranges, but some seemingly intermediate specimens have constituted a difficult problem in classification (Hoover, 1939, p. 557). Certain plants of this relationship occurring in Tulare County have the general aspect of *B. elegans* and, unlike true *B. coronaria,* have a turbinate rather than cup-shaped perianth-tube, but the relatively long staminodia, evident even in herbarium specimens, showed the plants to be not identical with typical *B. elegans.* Observation of living plants now leads to the conclusion that this variant should be placed in varietal status. Specimens from San Bernardino County which have been referred to *B. elegans* are probably essentially identical, but I should prefer to study living plants before definitely citing them under this name.

The geographical position of *B. elegans* var. *australis* suggests a possible origin by hybridization between the widely distributed *B. elegans* var. *elegans* and *B. coronaria* var. *kernensis.* However, in the absence of experimental evidence, it is by no means necessary to invoke hybridization to account for the characters and occurrence of this variety. Presumably these species and varieties, closely related as they unquestionably are, had a common ancestor. In the course of evolution, the varying forms of the ancestral population, it may be postulated, became sorted out into more or less distinct areas of distribution.

As a review of the named variants of *B. elegans,* the following key to varieties is offered:

Staminodia flat, acute, white, shorter than the stamens.
Umbels loose; staminodia 9–11 mm. long; filaments 4–6 mm. long; anthers 7–10 mm. long ..... var. *elegans*
Umbels relatively compact; staminodia 7–8 mm. long; filaments 3 mm. long; anthers 6–7 mm. long ..... var. *mundula*
Staminodia slightly involute, obtuse, purplish, longer than the stamens.. ..... var. *australis*

References

GREENE, E. L. Some genera which have been confused under the name Brodiaea. Bull. Cal. Acad. Sci. 2: 125–144 (1886).

HOOVER, R. F. A revision of the genus Brodiaea. Am. Midl. Nat. 22: 551–574 (1939).

——. A systematic study of Triteleia. Am. Midl. Nat. 25: 73–100 (1941).

——. Further observations on Brodiaea and some related genera. Plant Life 11: 13–23 (1955).

THE CALIFORNIA FLORA AND ITS PROVINCE

BY JOHN THOMAS HOWELL

As I was preparing my catalogue of California endemics (1955) based on those so-indicated in Jepson's Manual of the Flowering Plants of California (1923-25), I was aware of two weaknesses in the list: (1) the inclusion of certain plants as endemics that are known to extend beyond the state boundaries; and (2) the exclusion of many typically Californian plants that range into northern Baja California or southwestern Oregon. At that time, it was my intention to prepare an up-to-date corrected list of endemics, the endemics still determined by the political boundaries of the state; but on further consideration, I decided that a study of endemism in a California area based on a natural floristic concept would yield results of higher phytogeographic importance. Immediately the questions arose: is there a natural California flora; and if there is, what are its boundaries?

I believe that there is a segment of vegetation along the Pacific coast of North America distinctive and extensive enough to be termed the California flora. Two marks for this flora are the high endemism which is found in both genera and species, and the distinctive associations in which these genera and species occur. Endemism in the California flora is of that proportion

which one usually associates with insular, not with continental, floras. Moreover, the endemics, both generic and specific, display all of the diversity of distribution and of origin one might expect in a well-matured flora — some are broadly distributed and others are extremely limited; some show boreal affinities, many austral. Also this endemism pervades all groups of seed plants from gymnosperms to sunflowers, and is found in all growth forms, from ephemeral herbs to giant trees.

These endemic plants, as well as others growing with them that are more widespread, become assorted because of diverse geological, geographic, and climatic factors, and give rise to several plant associations which impart to the landscape aspects that are often peculiarly Californian. In broad terms I would list the following plant associations as those most typical:

1. Redwood forest and its forest borders.
2. Montane ("Sierran") coniferous forest.
3. Closed-cone pine and cypress forest.
4. Sonoran chaparral.
5. Coastal and interior brush and sagebrush.
6. Hill and valley grassland and savanna woodland.

Partly due to the conditions under which they have developed and partly due to the many endemic plants that are found in them, these associations have an appearance more or less distinctive, even when they are as widespread as coniferous forest or grassland. On the other hand, the montane coniferous forest of California merges gradually with that of the Cascade Mountains in Oregon and even the chaparral has a rather widespread development in the mountains of central Arizona.

In general, however, the above-listed associations are as Californian as the many endemic plants that grow in them, and, together with those plants, are a distinctive mark of a California flora. Regardless of how this flora may fit into a hierarchy of American floras or biologic provinces, whether as a distinct major flora, or whether as a subdivision of some broader floristic concept, there is such a flora, transitional from boreal and mesophytic to austral and desert, that is worthy of recognition.

The high endemism and distinctive plant formations characteristic of the California flora extend from southern Oregon to northern Baja California; hence, in outlining a floral province, it is necessary to cross political boundaries in order to encompass

the entire flora. On the other hand, all of the state of California is not within the California floral province since there are extensive areas in the eastern part of California that cannot be included in the California province, areas to be related floristically in large part to the Columbia Plateau, Great Basin, or Sonoran Desert. Because, however, the largest part of the province lies within and centers in the state, it seems entirely proper to call the province the California Floral Province and its flora, the California Flora.

When delimiting a continental flora it is generally not possible to establish a definite lineal boundary except where the boundary is defined by sudden changes in the character of the terrain, by large bodies of water or by abrupt mountain ranges. Otherwise a given flora merges gradually with that of the adjacent province with the zone of transition sometimes many miles broad. Both kinds of boundaries delimit the California province: the Pacific Ocean forms most of the western boundary and the precipitous eastern escarpment of the Sierra Nevada, Sierra Madre, Sierra Juarez, and Sierra San Pedro Mártir establishes most of the eastern boundary; but on the north and south where the California flora merges gradually with the Northwest Coast-Cascade and Sonoran Desert floras respectively, the boundary is not so definite. The following outline gives the boundaries of the California Floral Province as I now accept it, but with further study it may be necessary to modify certain details.

The northernmost point of the California Floral Province is on the Oregon coast in the vicinity of Coos Bay. There, due to the effect of higher summer temperatures modified by coastal fogs, certain California plants reach their northern limit and there also certain ancient rocks of the Klamath Mountain area reach their northern limit. From Coos Bay the boundary runs southeasterly to the divide between the Umpqua and Rogue rivers and thence continues on southeasterly, up the arm of the Rogue River Valley in which Ashland is situated, to the Oregon-California line. This floristic boundary excludes from the California Floral Province all of the Cascade Mountains in Oregon and includes in the province the Klamath Mountains, which continue on southward into California to encompass such ridges as the Marble Mountains, Scott Mountains, and Trinity Alps. Whereas most of the Rogue River drainage west of the Cascade

Mountains is included in the California province, the floristically closely related Umpqua River Valley is not, it being better considered a transitional zone from the California province to that of the Northwest Coast and Cascades.

In California the boundary extends southerly along the east side of the Klamath area, and from the vicinity of Mt. Shasta turns southeastward to the north end of the Sierra Nevada near Susanville. This excludes from the California province Mt. Shasta, Shasta Valley, eastern Siskiyou County, and all of Modoc County, but includes Mt. Lassen and the highlands around it. The line may be altered to include Mt. Shasta, but at present it is considered Cascadian floristically, as certainly it is geologically.

The line then runs southerly along the east side of the Sierra Nevada, taking in the Lake Tahoe angle of Nevada, and on as far as the Tehachapi Mountains. This cuts off part of Lassen County and most of Mono and Inyo counties. Whether to include in the California province a part of the Mohave Desert is a question, but at present I am excluding it, considering it a great transitional area (or floristic province of its own) where the floras of California, Great Basin, Southwestern Plateau, and Sonoran Desert merge. From the Tehachapi area the boundary continues along the north side of the San Gabriel and San Bernardino mountains, thence it rounds the east end of the San Bernardino Mountains and continues south along the east side of the San Jacinto, Santa Rosa, and Cuyamaca mountains to the Mexican border. This excludes from the California province the Colorado Desert and the mountains between the Colorado and Mohave deserts. The flora of the Colorado Desert belongs chiefly to that of the Sonoran Desert.

Since the mountain range and the flora do not stop at the border, the California Floral Province goes on too, taking in the chaparral and forest belts of the Sierra Juarez and of the Sierra San Pedro Mártir. The southernmost point of the California Floral Province on the mainland is near the southern end of the Sierra San Pedro Mártir, about 160 miles south of the international boundary.

On the west side of Baja California between these ranges and the Pacific Ocean, the southern boundary of the floral province is not very definite since there is no decided climatic or geo-

graphic break. This part of the boundary is determined by the southern limit of the chaparral which extends in typical form near sea level to the Santo Tomás Valley, a short distance south of Ensenada. Beyond Santo Tomás Valley, however, the transition between the chaparral and the Sonoran Desert is very gradual, so that the northern boundary of the desert is not reached for about 100 miles and many California plants extend for varying distances southward into this broad transition zone to mingle with desert plants. Shreve (1936) places the northern boundary of the Sonoran Desert on the west coast of Baja California about 20 miles north of Rosario.

The islands off southern California belong entirely to the California province. On Guadalupe and Cedros islands off Baja California, however, the higher ridges belong to the California province, while the more desert lowlands belong to the Sonoran Desert or to the transition zone between chaparral and desert.

Jepson in the opening pages of his Manual outlines the province of a California flora similar in many details to the one proposed here, but after arguing strongly in favor of it, he devotes the remainder of the work to a California flora determined by political boundaries.

A California Floral Province having the character and extent outlined is a sort of super-biotic province in the sense of Dice (1943). Dice says that a biotic province "covers a considerable and continuous geographic area and is characterized by the occurrence of one or more important ecological associations that differ, at least in proportional area covered, from the associations of adjacent provinces. In general, biotic provinces are characterized also by peculiarities of vegetation type, ecological climax, flora, fauna, climate, physiography, and soil." The California Floral Province is not only marked as a coherent "super-biotic province" by its flora and distinctive plant associations, but it is also a region physiographically and climatically distinct. In a generalized way the area is almost completely isolated by the Pacific Ocean, the mountains of southwestern Oregon, the montane axis from the Sierra Nevada to the Sierra San Pedro Mártir, and the desert of Baja California. In this great area the climate is characterized by precipitation chiefly in the winter but with summer dryness somewhat alleviated along the coast by dense fogs. Botanically, physiographically, and climatically

the California Floral Province is a distinct area and it and its flora are worthy of delimitation and description.

BIBLIOGRAPHY

Abrams, L. R. 1910. Phytogeographic features *in* a Phytogeographic and Taxonomic Study of the Southern California Trees and Shrubs. Bull. N. Y. Bot. Gard. 6: 307–322.

1923. Introduction *in* Illustrated Flora of the Pacific States. Pp. v–viii.

Brandegee, T. S. 1893. Southern extension of California flora. Zoe 4: 199–210.

Dice, L. R. 1943. The Biotic Provinces of North America. viii + 78 pp.

Howell, J. T. 1955. A tabulation of California endemics. Leafl. West. Bot. 7: 257–264.

Jepson, W. L. 1925. Outline of geographic distribution of seed plants in California *in* a Manual of the Flowering Plants of California. Pp. 3–20.

Mason, H. L. 1936. The principles of geographic distribution as applied to floral analysis. Madroño 3: 181–190.

Munz, P. A. 1935. A discussion of distribution of southern California plants *in* a Manual of Southern California Botany. Pp. vii–xxviii.

Peck, M. E. 1941. Plant areas of Oregon *in* a Manual of the Higher Plants of Oregon. Pp. 10–30.

Shreve, F. 1936. The transition from desert to chaparral in Baja California. Madroño 3: 257–264.

1942. The vegetation of Arizona *in* Kearney and Peebles, Flowering Plants and Ferns of Arizona. Pp. 10–23.

1951. Vegetation of the Sonoran Desert *in* Shreve and Wiggins, Vegetation and Flora of the Sonoran Desert. Carnegie Institution of Washington Publication No. 591, Vol. 1.

THE CALIFORNIA FLORAL PROVINCE AND ITS ENDEMIC GENERA

BY JOHN THOMAS HOWELL

In my "Tabulation of California endemics," I listed 28 genera restricted to California in a political, not a phytogeographic, sense (Leafl. West. Bot. 7: 260), but because I overlooked several distributional references and have subsequently subtracted four of those genera (ibid., 7: 290; 8: 59), the number of genera strictly confined to California is now 24. Since in my description and delimitation of a natural California flora (supra, pp. 133–137) I echoed the opinion of former students of this flora in stating that the large number of endemics is one of its chief marks (cf. Jepson, 1925, p. 4; Eastwood, 1947, p. 55), I have been inter-

ested in noting how the change from a political to a natural floristic boundary might alter the number of endemics. There has not yet been time to enumerate the many species and varieties, but a preliminary list of genera floristically Californian is being presented herewith that totals 65. So large and impressive a number of endemic genera would certainly appear to justify a phytogeographic concept for a California flora, and the importance of the floristic viewpoint is further enhanced when one notes the inclusion of such genera as *Sequoia, Umbellularia, Adenostoma,* and *Hemizonia.*

It should be remembered, however, that the boundaries of a continental flora are generally not definite lines like those of a political subdivision and that whether or not a certain plant is counted as endemic may be a matter for discussion. In the list that I am presenting here, several genera are included whose distributions extend somewhat beyond the limits of the California Floral Province, but in each case the distribution of the genus is chiefly within our province and the extra-limital distribution is minor in extent or more or less confined to an area transitional to an adjacent flora. Thus, *Darlingtonia* and *Peltiphyllum* which range somewhat north of the province line in Oregon are listed as Californian, whereas *Cneoridium* and *Bergerocactus* are excluded and interpreted as genera endemic to the transitional zone between the California and Sonoran Desert floras. Such genera as *Cycladenia* with an isolated variety in southern Utah and *Malacothamnus* with a single recently recognized Chilean species[1] are excluded from the endemic count. The distributional data for the genera are mostly derived from current revisions, floras, and plant lists as they pertain to the Pacific coast states.

SEQUOIA Endl. *(Taxod.)* — Sw. Ore. to Calif.
SEQUOIADENDRON Buchholz *(Taxod.)* — Sierra Nevada, Calif.
NEOSTAPFIA Davy *(Gram.)* — Great Valley, Calif.
ORCUTTIA Vasey *(Gram.)* — Shasta Co., Calif., to San Quintin, Baja Calif.
BLOOMERIA Kell. *(Lil.)* — Calif. to n. Baja Calif.
CHLOROGALUM Kunth *(Lil.)* — Coos Co., Ore., to n. Baja Calif.
MUILLA Wats. *(Lil.)* — Calif. to n. Baja Calif., e. to Mohave Desert and Great Basin borders.
ODONTOSTOMUM Torr. *(Lil.)* — Calif.

[1] *Malacothamnus chilensis* (Gay) Krapovickas, Bol. Soc. Argent. Bot. 4: 189 (1952).

Schoenolirion Durand *(Lil.)* — Sw. Ore. to n. Calif.
Hollisteria Wats. *(Polygon.)* — Calif.
Aphanisma Nutt. *(Chenop.)* — S. Calif. to n. Baja Calif.
Umbellularia Nutt. *(Laur.)* — S. Douglas Co., Ore., to s. Calif.
Dendromecon Benth. *(Papav.)* — Calif. to n. Baja Calif.
Romneya Harv. *(Papav.)* — S. Calif. to n. Baja Calif.
Stylomecon G. Taylor *(Papav.)* — Calif. to n. Baja Calif.
Heterodraba Greene *(Crucif.)* — S. Ore. to n. Baja Calif.
Tropidocarpum Hook. *(Crucif.)* — Calif. to n. Baja Calif., e. to Mohave Desert.
Darlingtonia Torr. *(Sarrac.)* — Lane Co., Ore., to n. Calif.
Hasseantiius Rose *(Crass.)* — S. Calif. to n. Baja Calif.
Sedella Britt. & Rose *(Crass.)* — Calif.
Bensonia Abrams & Bacigalupi *(Saxifr.)* — Sw. Ore. to nw. Calif.
Carpenteria Torr. *(Saxifr.)* — Central Sierra Nevada, Calif.
Jepsonia Small *(Saxifr.)* — Calif. to n. Baja Calif.
Peltiphyllum Engler *(Saxifr.)* — Benton Co., Ore., to Calif.
Saxifragopsis Small *(Saxifr.)* — Sw. Ore. to nw. Calif.
Lyonothamnus Gray *(Ros.)* — Islands of s. Calif.
Adenostoma H. & A. *(Ros.)* — Calif. to n. Baja Calif.
Chamaebatia Benth. *(Ros.)* — Calif. to n. Baja Calif.
Pickeringia Nutt. *(Legum.)* — Calif. to n. Baja Calif.
Fremontodendron Cov. *(Stercul.)* — Calif. to n. Baja Calif.
Heterogaura Rothrock *(Onagr.)* — S. Ore. to Calif.
Apiastrum Nutt. *(Umbell.)* — Calif. to n. Baja Calif. (and Arizona?).[2]
Oreonana Jepson *(Umbell.)* — Calif.
Sarcodes Torr. *(Eric.)* — S. Ore. to Calif. (Baja Calif. acc. Jepson).
Kalmiopsis Rehder *(Eric.)* — Sw. Ore.
Ornithostaphylos Small *(Eric.)* — N. Baja Calif.
Hesperelaea Gray *(Olea.)* — Guadalupe Island, Baja Calif.
Draperia Torr. *(Hydrophyll.)* — Calif.
Lemmonia Gray *(Hydrophyll.)* — Calif. to n. Baja Calif.
Turricula Macbride *(Hydrophyll.)* — Calif. to n. Baja Calif.[3]
Acanthomintha Gray *(Lab.)* — S. Coast Ranges, Calif.
Pogogyne Benth. *(Lab.)* — Sw. Ore. to n. Baja Calif. (Guadalupe Island).
Howelliella Rothmaler *(Scroph.)* — S. Coast Ranges, Calif.
Ophiocephalus Wiggins *(Scroph.)* — Sierra San Pedro Mártir, Baja Calif.

Compositae, Astereae

Benitoa Keck — S. Coast Ranges, Calif.
Corethrogyne DC. — Coos Co., Ore., to n. Baja Calif.
Eastwoodia T. S. Brandegee — S. Coast Ranges, Calif.
Pentachaeta Nutt. — Calif. to n. Baja Calif.
Tracyina Blake — Nw. Calif.

[2] The three collections that are reported from Pima Co., Ariz., by Mathias and Constance (Fl. Pl. and Ferns Ariz., 639, —1942) perhaps represent an introduction into Arizona. In Abrams' Illustrated Flora (3: 222, —1951) Mathias and Constance give *Apiastrum* as "a monotypic Californian genus."

[3] One extra-limital collection of *Turricula Parryi* (Gray) Macbride is known to me: Surprise Canyon near Panamint City, Panamint Mts., 6800 ft., *Howell 4024*, June 18, 1928.

COMPOSITAE, MADIEAE

ACHYRACHAENA Schauer — Douglas Co., Ore., to s. Calif.
ADENOTHAMNUS Keck — San Antonio (between Tiajuana and Ensenada), n. Baja Calif.
BLEPHARIZONIA Greene — S. Coast Ranges, Calif.
CALYCADENIA DC. — N. Umpqua Valley, Ore., to n. Baja Calif.
CENTROMADIA Greene — Sw. Oregon to s. Calif.
HEMIZONIA DC. — Sw. Ore. to n. Baja Calif.
HOLOCARPHA Greene — Calif.
HOLOZONIA Greene — Calif.

COMPOSITAE, HELENIEAE

BAERIOPSIS J. T. Howell — Guadalupe Island, Baja Calif.
CROCKERIA Greene — San Joaquin Valley, Calif.
MONOLOPIA DC. — Calif.
OROCHAENACTIS Cov. — S. Sierra Nevada, Calif.
PSEUDOBAHIA (Gray) Rydb. — Calif.
VENEGASIA DC. — S. Calif. to n. Baja Calif.
WHITNEYA Gray — Calif. (to "Eagle Lake, Lassen Co.").

COMPOSITAE, CICHORIEAE

PHALACROSERIS Gray — Sierra Nevada, Calif.

REFERENCES

EASTWOOD, A. 1947. Endemism in the flora of California. Contrib. Gray Herb. 165: 55–62.
JEPSON, W. L. 1923–1925. A Manual of the Flowering Plants of California. Berkeley, California.

MONTEREY CYPRESS AS A "NATURALIZED" SPECIES

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In its native occurrence, *Cupressus macrocarpa* Hartw. occupies one of the most restricted areas of any species of plants, namely, the coastal headlands on either side of Carmel Bay in Monterey County, California. Its total distributional area is probably less than one square mile (cf. Jepson, Trees of California, p. 75). This cypress has been very widely distributed in cultivation, but seems hardly ever to reproduce itself spontaneously where not indigenous, and still less to increase the extent of planted stands. At least, if such occurrences have been ob-

served, there has been a notable lack of published reports. Dr. C. B. Wolf, in his exhaustive treatise "The New World Cypresses," did not mention a single instance of such. The only report of this sort which has come to my attention is one by Peter H. Raven, who states that the species is increasing by natural seeding at one spot in San Francisco (Leafl. West. Bot. 6: 210,—1952).

A row of large cypresses, evidently planted many years ago, is found near the coast in northern San Luis Obispo County, a short distance south of the Monterey County line. Around these old trees are many younger trees ranging in size from small seedlings to vigorous medium-sized individuals full of cones, all scattered in an irregular manner and very obviously the result of natural reproduction. The exact locality is on the south side of the second ravine north of San Carpoforo Creek, above (east of) State Highway number 1. A collection was made there January 22, 1955, *Hoover 8351*. This occurrence is of particular significance in view of the following quotation from Dr. Wolf's work.

"Examination of the present stands indicates that, for the most part, the cypresses occupy approximately all of the local area in each instance that is suitable for their growth, but that they are not sufficiently aggressive to colonize adjacent areas. Their seed production and methods of dispersal are such that there is practically no possibility of them reaching any nearby suitable areas, even if such a spot were only a mile or two away." (El Aliso 1: 9,—1948.)

It now appears that human agency, at least in two instances, has given the impetus to spontaneous extension of the range of Monterey cypress which would not otherwise have begun.

The reproductive vigor of the cypress near San Carpoforo Creek can be partly understood by the close similarity of the climate to that in its indigenous stands to the north. The soil, on the other hand, is at least of different origin if not, perhaps, of different composition. As a native species, Monterey cypress is restricted to areas of granitic rocks, but in this place where it has become introduced, the rocks are evidently of sedimentary origin (shale or sandstone).

Perhaps the publication of this note will evoke other similar reports. It would indeed be an occasion for surprise if the species in question has not undergone natural increase in some of the

numerous localities where the established trees grow successfully, particularly along the coastline of California.

A New Name for Senecio Websteri Greenm. — The name *Senecio Websteri* given by Greenman (Bot. Gaz. 53: 511,—1912) to a ragwort from the state of Washington is untenable, having already been used by J. D. Hooker in 1846 (Bot. Antarct. 317) for a plant from Patagonia. It may be called **Senecio neowebsteri**, nom. nov. Curiously enough, on the same page on which he published the homonymous name *Websteri*, Greenman provided a new name for another homonymous species of this genus (*S. Adamsi* Howell), but he must have neglected to look in the original volumes of the Index Kewensis to see whether his own new specific name had already been used. — S. F. Blake, Horticultural Crops Research Branch, U. S. Dept. Agriculture, Beltsville, Md.

Re-collections of Two Rare Miltitzias. In the introduction to my revision of species belonging to *Phacelia* sect. *Miltitzia* (Proc. Calif. Acad. Sci., ser 4, 25: 357–376,—1944), I took occasion to point out that "four are to be counted among the rarest of western plants. . . ." More recently, R. C. Barneby has re-collected two of these plants and has not only added to our meager number of study-specimens but has also added systematic data of value in his field observations.

Phacelia inyoensis (Macbr.) Howell has been known from only three collections made more than forty years ago along the east base of the Sierra Nevada in Owens Valley, Inyo County, California. On May 4, 1954, Mr. Barneby succeeded in re-locating this long-overlooked plant where, according to his field data, it spread small yellow-flowered mats over "dry granite sand in an alkaline seepage area, 3.5 miles west of Lone Pine at 4600 feet elevation" *(Barneby 11329)*.

On May 17, 1955, Mr. Barneby visited the clay hills at DeBeque, Mesa County, Colorado, where he was successful in finding *Phacelia submutica* Howell, before that known only from the three collections made in the same region by G. E. Osterhout in 1911, 1912, and 1920. Mr. Barneby's collection data under his number *12738* read: "gumbo clay knolls, 1 mile north of DeBeque; herbage fetid; corolla-tube yellow, the narrow limb white."—John Thomas Howell.

California Stations for Trifolium incarnatum. Although crimson clover, *Trifolium incarnatum* L., has been noted in the literature as an introduced plant in California, definite citations for its occurrence have been very few. The following collections in the Herbarium of the California Academy of Sciences indicate its increasing prevalence in the last few years: 3.3 miles from Bangor on road to Oroville, Butte Co., *Raven 5458* in 1953 (cf. Leafl. West. Bot. 7: 151); sparsely scattered in hayfield southeast of Rutherford on the Silverado Trail, Napa Co., *Mr. & Mrs. H. C. Cantelow* in 1956; near Sonoma, Sonoma Co., *Lovegrove in 1954;* about 1 mile west of Ignacio, Marin Co., *G. T. Robbins 3618* in 1954; established on chaparral burn where it probably had been planted, 2 miles from Mission San Antonio on road to Santa Lucia Camp, Santa Lucia Mts., Monterey Co., *Howell 30616* in 1955; Cañada del Venadito (where probably introduced with grass seed on burn), Santa Ynez Mts., Santa Barbara Co., *Pollard in 1956.*—J. T. Howell.

Records of Ehrharta calycina in California. At least two stations may be cited that will record the spontaneous occurrence of the attractive South African bunch-grass, *Ehrharta calycina* Smith, in California: hillside burn (where probably seeded), Casitas Pass, Ventura Co., *H. M. Pollard,* Mar. 27 and June 22, 1955; common in light sandy soil in a clearing in eucalyptus grove, Nipomo Mesa, San Luis Obispo Co., *Twisselmann 2632,* Apr. 10, 1956. Mr. Twisselmann also collected the species in April, 1956, on the Chris Twisselmann Ranch in eastern San Luis Obispo Co. *(No. 2729),* but he reports that this collection came from a small trial plot planted in 1955 that had received some irrigating. The species is noted by Mrs. Chase in Hitchcock's Manual ed. 2 (p. 551) as being cultivated at Davis, California.

The genus *Ehrharta,* belonging to the *Phalarideae,* has been known in California for a number of years from the naturalized occurrence of *E. erecta* Lamk. about the University of California campus at Berkeley (cf. *Howell 23289* in 1947). This species also occurs on the Westwood campus of the University of California at Los Angeles *(Raven 9397).*—J. T. Howell.

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THE TYPIFICATION OF GALIUM MULTIFLORUM VAR. WATSONI GRAY

BY ARTHUR CRONQUIST

The New York Botanical Garden, New York

In a recent taxonomic treatment of the *Galium multiflorum* complex (Contr. Dudley Herb. 5: 1–21, —1956), Friedrich Ehrendorfer has selected as the lectotype of *Galium multiflorum* var. *Watsoni* Gray a specimen collected by Cusick in Oregon. This typification is contrary to an earlier typification by Heller, and cannot be accepted.

Gray's original description (Syn. Fl. N. Amer. 1, pt. 2: 40, —1884) was:

"*Var. Watsoni.* Mostly glabrous and smooth: leaves thinner, oblong-lanceolate (commonly about half-inch long and 2 lines wide), with lateral nerves either distinct or obsolete.——*G. multiflorum,* Watson, l.c. in great part.——Cañons and gulches, N. Arizona to E. Oregon and adjacent Idaho."

The reference to "Watson, l.c." is to Bot. King Expl. p. 135. Watson's specimens, distributed under the number 484, were said by him to be "frequent in the East Humboldt Mountains, Nevada, and in the Wahsatch; 5-9000 feet altitude; June-August." *Watson 484* is now represented in the Gray Herbarium by two specimens: one collected in the Wahsatch (nowadays regularly spelled Wasatch) Mountains in August, 1869, at an altitude of 8000 feet; the other collected in the East Humboldt Mountains in August, 1868, at an elevation of 7000 feet. The specimen from the Wasatch conforms to Gray's description, but the leaves of the specimen from the East Humboldt Mountains are a little shorter and broader than indicated in the description, and are distincly scabrous rather than glabrous.

The specimen of *Watson 484* from the Wasatch Mountains, at the Gray Herbarium bears Gray's own annotation as var. *Watsoni,* the label attached directly to the base of the specimen. The scabrous specimen from the East Humboldt Mountains does not now bear Gray's annotation, although it may conceivably have done so at one time; the portion of an original herbarium sheet bearing this specimen and Watson's label for it has been cut off and remounted on another sheet. There are also some

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other sheets at the Gray Herbarium which carry Gray's annotation as *G. multiflorum* var. *Watsoni.* Among these is the Cusick collection of 1878 from Union Co., Oregon, chosen by Ehrendorfer as the lectotype of var. *Watsoni.* In my opinion neither the Cusick specimen nor any of the other original specimens conforms to the original description better than the Watson specimen annotated by Gray.

From the fact that Gray cited part of Watson's material and named his new variety for Watson, and from the fact that the only reference in the original description to any other material is the indirect one implied by the listed geographic range, it would seem that some part of the Watson material could and probably should constitute the type of the variety. From the further fact that only one of the Watson collections, the one from the Wasatch at 8000 feet, conforms to the original description and bears Gray's annotation as var. *Watsoni,* it seems that this collection would be a proper and certainly unobjectionable choice as the lectotype of the variety. That is exactly the choice made by Heller in 1898 when he raised *G. multiflorum* var. *Watsoni* to specific status as *G. Watsoni* (Bull. Torr. Bot. Club 25: 627, —1898). After quoting Gray's description, Heller commented that: "From description, the type of this would be no. 484, collected on the Wahsatch Mountains, Utah, August, 1869, altitude 8000 feet. But on the same sheet in the Columbia University Herbarium, and under the same number, 484, are two other specimens, which are not of this species. One was collected on the Wahsatch Mountains, Utah, July, 1869, and the other on the East Humboldt Mountains, Nevada. These have shorter, rounder, pubescent leaves." By these words Heller effectively selected as the lectotype of *G. multiflorum* var. *Watsoni* that part of *Watson 484* which was collected in the Wasatch in 1869 at an altitude of 8000 feet. The fact that the specimens which he saw were in the Columbia University Herbarium rather than at the Gray Herbarium is immaterial, since his lectotype is represented at both herbaria, and the specimen at the Gray Herbarium actually bears Gray's annotation as var. *Watsoni.* The Columbia and the Gray Herbarium specimens of the Heller lectotype are very much alike.

According to the International Code of Botanical Nomenclature, 1956 edition, Appendix IV, paragraph 4e, "The first choice of a lectotype should be followed by subsequent workers

unless it can be shown that the choice does not fit the original description as well as another of the original elements. . . . ." Heller's typification of *G. multiflorum* var. *Watsoni* must therefore be accepted, and Ehrendorfer's recent attempt to substitute the Cusick specimen as the lectotype must be rejected.

The typification of *G. multiflorum* var. *Watsoni* becomes of some significance because according to Ehrendorfer's taxonomic interpretation of the group the Cusick specimen does not belong to the same species as the Watson specimen. *Galium Watsoni* as defined by Ehrendorfer, and as typified by him on the Cusick specimen, occurs in Washington, Oregon, Idaho, and northwestern Nevada, but not in Utah. If Heller's typification is accepted, as I believe it must be, then those who accept Ehrendorfer's taxonomic treatment will have to find another name for the plant he calls *G. Watsoni.* To judge from his published synonymy, this will require a new combination or a new name.

Galium hypotrichium Gray subsp. *utahense* Ehrendorfer is defined by Ehrendorfer to include the Heller lectotype of *G. Watsoni,* as he has confirmed in personal correspondence with me. Inasmuch as priority under the Rules holds only within categories, those who accept *G. hypotrichium* subsp. *utahense* as a proper subspecific taxon can properly use Ehrendorfer's name. At both the specific and the varietal levels, however, there is an earlier epithet *(Watsoni)* available for this taxon as defined by Ehrendorfer.

I refrain from proposing a new name for *G. Watsoni* sensu Ehrendorfer because I am not convinced that it is taxonomically separable from *G. multiflorum.* Ehrendorfer's closing comment is worthy of serious consideration. After recognizing 10 species and a number of subspecies, 1 species and 4 subspecies of which are described as new, he says: "Today it still may be a matter of debate whether a rather narrow concept of species should be used as is proposed here, or whether this would be better replaced by lumping all but a few taxa *(G. hallii, ? G. matthewsii, ? G. parishii)* into one large entity."

I wish to thank Dr. Reed C. Rollins, Director of the Gray Herbarium, for his kindness in making the original material of *Galium multiflorum* var. *Watsoni* Gray available to me.

THE LECTOTYPE OF GALIUM MULTIFLORUM VAR. WATSONI

BY F. EHRENDORFER
Vienna, Austria

In order to make possible an immediate answer to the foregoing article, Dr. Cronquist has kindly informed me in detail about his position in the matter of typification of *Galium multiflorum* var. *Watsoni*. For this and for his help in clarifying some open problems I want to thank him. Also I am grateful to the editor of LEAFLETS OF WESTERN BOTANY for prompt acceptance of my manuscript.

In my survey of the *Galium multiflorum* complex (Contr. Dudley Herb. 5: 1–21,—1956), I selected a new lectotype for *G. multiflorum* var. *Watsoni* in place of an earlier one chosen by Heller. To make my presentation as short and compact as possible, I did not give detailed reasons for this in my original note. As my procedure has been questioned by Dr. Cronquist I have to make up for that brevity here.

1. In the diagnosis of *G. multiflorum* var. *Watsoni* stress is put on the differential character of the oblong-lanceolate leaf-shape with an average length-breadth index of 3:1. This is easy to understand, as the material personally annotated by Asa Gray in his herbarium mainly consists of the northwestern taxon (called *G. Watsoni* in my treatment) for which numerous measurements have shown the important key-character of leaf length-breadth index to be ± 3.0–3.5.

2. In addition the material personally annotated by Gray also contains part of the collection *Watson 484, i.e.* from the Wasatch Mts., August, 1869 (a scabrous specimen with the same number from the East Humboldt Mts. was excluded by Gray; it belongs to *G. hypotrichium* subsp. *hypotrichium).* The single specimen of *Watson 484* from the Wasatch Mts. in the Gray Herbarium forms only part of Watson's collections in that area (cf. point 3) and represents, by accident, an extremely narrow-leaved form of the Wasatch population which has an average leaf length-breadth index of ± 2.4–2.6. In spite of the fact that the leaves of this *Watson 484* specimen are still slightly broader than is indicated in the diagnosis, it was included by Gray in his new variety, as it was the only material of the Wasatch taxon available to him at that time.

3. The specimen of *Watson 484* which Heller had in hand is in the Columbia University Herbarium and was *not* seen by Gray. In addition to the collections represented under this number in Gray Herbarium, the Columbia University Herbarium contains a second collection from the Wasatch Mts. made in July, 1869. This latter collection is quite typical of the local population and has broader leaves. It is Dr. Cronquist's and my firm opinion that these two (like all other) Wasatch collections represent the *same* taxon. That Heller thought that they were two species was a mistake; that he spoke of the extreme narrow-leaved specimen which barely fits the diagnosis as "the type" of var. *Watsoni* is definitely a misrepresentation of what Gray meant by this taxon. Had Gray seen the *full* material of *Watson 484* or even more broad-leaved collections from the Wasatch Mts., he certainly would *not* have included them in his variety which basically fits only the narrow-leaved northwestern taxon so amply represented in his herbarium. It is my opinion therefore that according to the Rules the Cusick collection from Union County, Oregon, is a better representation of Gray's variety, its description, and the paratypes in his herbarium than the deviating and atypical single fragmentary specimen of *Watson 484* from the Wasatch Mts. in the Gray Herbarium.

4. What would have to be done if Heller's lectotype were accepted? The name var. *Watsoni* would have to be applied to the Wasatch taxon for which its description certainly fits less well than for the northwestern entity. As other names are already available on the subspecific level for the Wasatch taxon (and as it certainly does not deserve specific status), the well-known name would have to be dropped. Contrary to this, the northwestern entity would be without a name and a new one would have to be chosen, in spite of the fact that *G. Watsoni* has been used for it for such a long time.

Summing up the above points, I feel that there is no cogent reason to reëstablish the Heller lectotype of var. *Watsoni* and to load the taxonomy of the *Galium multiflorum* group with more new names and confusing rearrangements. It is my opinion that the Rules should not be interpreted in a hair-splitting manner but in a way so as to insure current use of names and general taxonomic practice as much as possible.

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MIMULUS REIFSCHNEIDERAE, A NEW MIMULUS FROM NEVADA

BY GABRIEL EDWIN
Beltsville, Maryland

Mimulus Reifschneiderae Edwin, spec. nov. Annuus; caulis teres, erectus, ramosus, usque ad 17 cm. altus, glanduloso-pubescens; folia sessilia, 3-nervia, cum floribus fasciculata (jugo infimo excepto), lanceolata vel lanceolato-ovata, acuta vel breviter acuminata, pubescentia vel glanduloso-pubescentia, ciliata, interdum subglabra, saturate rubescentia, ea jugi infimi usque ad 3 cm. longa, cetera brevissima; calyx usque ad 10 mm. longus, maturitate capsula completus, oblongus vel ovatus, venis ciliatis, dentibus aequalibus ¼ longitudinis tubi aequantibus et glanduloso-pubescentibus; corolla 1.7–2.3 (2.6) cm. longa, tubo calyce 2–2.5-plo longiore, infundibuliformi vel campanulato, laete aureo intus ad basim cristis 2 dense pubescentibus pilis laete aureis, labiis aequalibus; antherae paulo longiores quam latiores apice linea breviter albo-ciliata ornatae; stylus pubescens; stigmatis lobi elliptici, aequilongi, breviter et rigide albo-pubescentes; capsula calyce paulo brevior usque ad paulo longior secundum suturas ambas per totam longitudinem dehiscens; semina utrinque inaequaliter apiculata.

Annual; stem terete, upright, branched, up to 17 cm. high, glandular-pubescent; leaves sessile, 3-nerved, clustered with the flowers (except the 2 lowermost), lanceolate to lanceolate-ovate, tip acute to short-acuminate, margins entire or subentire, ciliate, tissue pubescent or glandular-pubescent, occasionally almost glabrous, often turning dark red especially below, the two lowest leaves up to 3 cm. long, the others much shorter; calyx about 10 mm. long (or less), filled by the mature capsule, sometimes slightly expanded, oblong to ovate, veins ciliate and strongly angled, the tissue mostly glabrous, light green to almost white, teeth about ¼ the size of the tube, equal or almost so, acute or acutish at the tip, ciliate and glandular-pubescent; corolla up to 2.6 cm. long (mostly 1.7–2.3 cm.), withering in place, tube well exserted, bright golden-yellow, with 2 small, densely hairy ridges inside ventrally, the hairs bright golden-yellow, this small palate not at all obstructing the throat, the funnelform to campanulate tube and broad throat marked with dark brown flecks and lines below, lips equal or nearly so, lobes entire, rotate, about 14–18 mm. across, sinuses v-shaped, the tube 2 to 2.5 times the calyx; anthers little longer than broad, forming crosses in pairs, with a row of small white cilia across the top, filaments glabrous, upper pair of stamens occasionally little exserted; style pubescent with short white hairs over most of its length, stigma-lips equal, elliptical, beset with short, stiff, white hairs (occasionally almost glabrous); capsule at maturity little shorter to little longer than the calyx, lanceolate-ovoid to ovoid, tip often acuminate, completely dehiscent along both sutures, placentae splitting their entire length, adhering to the valves; seeds numerous, smooth, shiny, ellipsoid, unequally apiculate at both ends (occasionally only at one end).

Type: *Olga Reifschneider 212* (US), collected on Pyramid

Lake Road 10 miles from Reno, Washoe County, Nevada, June 12, 1956.

This species, named in honor of its collector, is the second one to be described recently from the Pyramid Lake Road, the other being my *M. washoensis.** The present plant is striking because of its very bright golden-yellow corolla. Its style pubescent over the entire length, corolla-lobes abruptly rotate, and capsule dehiscent along both sutures indicate affinities with sections other than *Eunanus* Gray, where it is tentatively placed. Although most of the other characters would lead to *Eunanus,* there is no section at present recognized that will accommodate the combination of characters displayed by *M. Reifschneiderae.*

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THE INTRODUCED SPECIES OF BROMUS, SECT. CERATOCHLOA, IN CALIFORNIA

BY PETER H. RAVEN

Recent field work on the weedy grasses of northern California, principally by G. L. Stebbins, Jr., J. T. Howell, and the writer, has disclosed the fact that instead of a single introduced species of *Bromus,* sect. *Ceratochloa (B. catharticus* Vahl), occurring as a weed in the flora of the State, there are three. Dr. Stebbins, of the Department of Genetics, University of California, Davis, California, first called my attention to the fact in 1951 that certain long-awned forms which constituted an anomalous element in this assemblage, or were more often referred to *B. carinatus* H. & A. or *B. marginatus* Nees, were conspecific with *B. stamineus* E. Desv., a South American species. In addition, short-awned plants which have been referred to *B. catharticus* previously, may be divided into two distinct groups, as will be shown in the key. Both of these additional species have become widespread in California and have been collected rather frequently.

Dr. Stebbins has provided the data on which the following key is based, as well as the native distribution of these species. The specimens cited are from the herbarium of the California

*The type of *M. washoensis* Edwin is *P. A. Lehenbauer 1096,* not *P. A. Lehanbauer 1906* as given in the original description (Leafl. West. Bot. 7:221,—1955).

Academy of Sciences, San Francisco (CAS), the Dudley Herbarium of Stanford University (DS), the herbarium of the University of California at Berkeley (UC), and the Agronomy Herbarium of the University of California, Davis (AHUC). While the citations are thus not extensive, they will serve to outline the known distributions of these plants in the State, as the key indicates the differences between them, and thus make this information available for further study. The writer is especially grateful to Dr. Stebbins for help and encouragement given in the course of this study.

KEY TO THE SPECIES OF BROMUS, SECT. CERATOCHLOA, IN CALIFORNIA

Lemmas awnless, or bearing short awns up to 2.5 mm. long.
- Leaves relatively broad, bright- or yellowish-green; lemmas 14–18 mm. long, 11–13-nerved, the nerves often close together ..... *B. catharticus* Vahl
- Leaves relatively narrow, bluish-green; lemmas 9–13 mm. long, 7–9-nerved, the nerves distinct..... *B. Haenkeanus* Presl

Lemmas bearing awns 3 mm. or more in length.
- Annual; upper glume nearly or quite equaling the lowest lemma; lemmas scabrous or nearly glabrous on the back, slightly or strongly ciliate-pubescent on the margins.... *B. arizonicus* (Shear) Stebbins[1]
- Usually perennial; upper glume distinctly shorter than lowest lemma; lemmas evenly pubescent or scabrous.
  - Spikelets rather strongly compressed laterally, the mature caryopsis distinctly thicker than broad; ovary at anthesis with a distinctly trilobate apex ..... *B. stamineus* E. Desv.
  - Spikelets only moderately compressed laterally, the mature caryopsis cylindrical or slightly broader than thick; ovary at anthesis entire or indistinctly trilobate..... group related to *B. sitchensis* Trin.[2]

BROMUS CATHARTICUS Vahl

In California, this is mostly a plant of rich soil and fairly well-watered situations, as in parks or about fields: common in the Sacramento Valley, fairly common in the north Coast Ranges and northern San Joaquin Valley, and apparently sporadic in southern California, with one station known in Inyo County.

Distribution: pampas of southern Brazil, Uruguay, and northeastern Argentina; widely introduced elsewhere in the New and Old Worlds.

Representative collections, California only: Eureka, Humboldt Co., *Henry*

[1] For a treatment of this native species, see Stebbins, G. L., Jr., H. A. Tobgy, and J. R. Harlan, "The cytogenetics of hybrids in Bromus II. Bromus carinatus and Bromus arizonicus," Proc. Calif. Acad. Sci., ser. 4, 25:307–322 (1944).

[2] These native species are referred by Agnes Chase in Hitchcock's Manual of the Grasses of the United States, ed. 2 (1950), to *B. sitchensis* Trin., *B. aleuticus* Trin., *B. breviaristatus* Buckl., *B. carinatus* H. & A., *B. marginatus* Nees, *B. maritimus* (Piper) *Hitchc.*, and *B. polyanthus* Scribn. The distinctness of these species is not considered here, but they are included as a group since they are the grasses most likely to be confused with *B. stamineus*.

Melde, February 8, 1902 (UC); Yuba City, Sutter Co., *Raven 6612* (CAS); Willows, Glenn Co., *Howell 29576* (CAS); Napa, Napa Co., *Raven 3000* (CAS); Berkeley, Alameda Co., *Stebbins 2746* (UC); Piedmont, Alameda Co., *Howell 30007* (CAS); Golden Gate Park, San Francisco, *Howell 13985* (CAS); Skyline Boulevard above San Bruno, San Mateo Co., *Howell 30010* (CAS); Stockton, San Joaquin Co., *E. E. Stanford 1505* (CAS); Santa Clara College, Santa Clara Co., *Dudley 4028* in 1895 (DS); Carmel, Monterey Co., *Howell 28955* (CAS); Las Positas Road near Veronica Springs, Santa Barbara, Santa Barbara Co., *Pollard in 1955* (CAS); Ventura, Ventura Co., *Pollard in 1945* (CAS), *in 1949* (UC); San Bernardino Co., *R. J. Smith in 1904* (UC); Yorba Linda, Orange Co., *Howell 30922, 30924* (CAS); San Diego, San Diego Co., *Howell 31116* (CAS); edge of stream, Saline Valley Trail, 4750 feet elevation, Inyo Mountains, Inyo Co., *Alexander & Kellogg 2879* (UC).

Bromus Haenkeanus Presl

This species, which seems to be more drought-resistant than the preceding, is commoner in the interior of the state. It has been reported from Coconino Co., Arizona (T. H. Kearney, Leafl. West. Bot. 7:172,—1954) and from Santa Barbara Co., California (C. F. Smith, A Flora of Santa Barbara, p. 16, —1952), where it is listed as "frequent in gardens and orchards."

Distribution: in the Andes from Colombia south to the Strait of Magellan and on the steppes of Patagonia in southern Argentina; introduced in North America.

Representative collections, North America. California: Salinas River bridge, King City, Monterey Co., *Howell 30577, 30578* (CAS); Chris Twisselmann Ranch, Temblor Range, San Luis Obispo Co., *E. C. Twisselmann 1177* (CAS); Santa Barbara, Santa Barbara Co., *Pollard in 1955* (CAS); Mojave, Kern Co., *Howell 26647* (CAS); Yorba Linda, Orange Co., *Howell 30923* (CAS); Ventura, Ventura Co., *Howell 30919* (CAS); Ridge Route west of Newhall, Los Angeles Co., *Howell 31126* (CAS); 2 miles northeast of La Verne, Los Angeles Co., *Wheeler 4085* (CAS); very common along irrigating ditches, Riverside, Riverside Co., *H. M. Hall 1365* in 1899 (UC), *E. S. Koethen,* August 12, 1897 (UC); common, San Bernardino Valley, San Bernardino Co., *S. B. Parish 11243* (UC); street weed, Sierraville, Sierra Co., *Howell 30889* (CAS); Reds Meadows, 7500 feet elevation, Madera Co., *Raven 3658* (CAS); Red Hill west of Bishop, Inyo Co., *Heller 8251* in 1906 (CAS); Jeffrey pine belt, Sage Flat to Olancha Pass, 8000 feet elevation, Inyo Co., *Howell 26736* (CAS); court-house yard, Independence, Inyo Co., *Jepson 906* (UC), *W. J. Bunney,* July 30, 1901 (UC); north end of Hessian Meadows on trail to Templeton Meadows 8800 feet elevation, Tulare Co., *Howell 26647* (CAS).

Nevada: alfalfa field, Mills Ranch, 4 miles southwest of Fallon, elevation 4000 feet, Churchill Co., *Mills & Beach 1130* (UC); Beatty, Nye Co., *Raven 6276* (CAS); 10 miles east of Sparks, Washoe Co., *Jean Harlan N1* (UC).

Utah: Price, Carbon Co., *W. D. Stanton 567* (CAS).

Arizona: roadside seep, Concho, elevation 6000 feet, Apache Co., *Gould & Phillips 4882* (UC).

Mexico. Coahuilla: along irrigation ditches on campus of La Escuela Superior de Agricultura, Buena Vista, about 5 miles southeast of Saltilla, *Gould 6382* (UC, mixture with *B. catharticus* Vahl).

BROMUS STAMINEUS E. Desvaux

Plants of this species were grown in Berkeley by P. B. Kennedy in about 1910, being used for experimental purposes, and apparently have spread outward from that area, following roadways and railroad tracks, often growing on disturbed soil. It has now become a fairly common weedy species in the coastal part of central California. In addition to the characters mentioned in the key, the rather compactly branched panicle is quite distinctive.

Distribution: endemic to central Chile; elsewhere known only as a weed in central California.

Representative collections from California: Hopland, Mendocino Co., *Stebbins 5207* (AHUC); Sebastopol, Sonoma Co., acc. Stebbins; Santa Rosa, Sonoma Co., *Abrams 13409* in 1931 (DS); Sonoma, Sonoma Co., *Howell 30148* (CAS); Oakville, Napa Co., *Raven 2836* (CAS); Olema, Marin Co., *Howell 30016* (CAS); East Peak of Mount Tamalpais, Marin Co., *Howell 29105* (CAS); Stinson Beach, Marin Co., *Howell 30144* (CAS); northeast edge of Vallejo, Solano Co., *Stebbins 5205* (AHUC); 2 miles southeast of Vacaville, Solano Co., *Stebbins 5206* (AHUC); San Francisco, *Howell 28319, 29956* (CAS); Golden Gate Park, San Francisco, *Raven 5518* (CAS); Sigmund Stern Grove, San Francisco, *Raven 10475* (CAS); Crockett, Contra Costa Co., *Stebbins 5204* (AHUC); Berkeley, Alameda Co., *P. B. Kennedy in 1915* (AHUC; noted as spreading from experimental plots; *see* Sampson, A. W., A. Chase, & D. W. Hendrick, California Grasslands and Range Forage Grasses, Calif. Agric. Exper. Sta. Bull. 724, p. 37, —1949); Menlo Park, San Mateo Co., *Howell 31446* (CAS); Monterey, Monterey Co., *Howell in 1954* (CAS); Placerville, Eldorado Co., *Howell 29654* (CAS); Ione, Amador Co., *Raven 5513* (CAS); Sonora, Tuolumne Co., *Howell 28999* (CAS, DS).

LUPINUS NOTES I

BY DAVID B. DUNN
University of Missouri, Columbia

LUPINUS VOLUTANS GREENE

E. L. Greene (Muhl. 8: 118, —1912) desecribed *Lupinus volutans* from a collection made by J. B. Leiberg on June 8, 1896, in the Malheur Valley of arid southeastern Oregon. Detling (Amer. Midl. Nat. 45: 493, —1951) apparently placed it under his *L. lepidus* ssp. *Cusickii* because of the dense shaggy villous pubescence, although the size of the flower and the size of the vegetative parts are considerably larger than those of *Cusickii*. Lyle Phillips (Wash. State Coll. Res. Studies 23: 184, —1955) considered it a part of typical *L. lepidus,* to which the flowers correspond quite closely. *Lupinus lepidus,* in its typical form, has only sparse pubescence and may be nearly glabrate, in addition to the fact, as pointed out by Detling, that typical *lepidus* is re-

stricted to the western side of the Cascade Mountains, mostly in Washington. Since Phillips considered pubescence in *Lupinus* to be of no significance, he placed *volutans* under *lepidus* and simply ignored the additional fact that a habitat in southeastern Oregon is entirely different from one on the western side of the Cascade Mountains in Washington.

If Leiberg's specimens were the only material of this plant, it might be considered as a possible hybrid or an aberrant individual. Indeed, *L. volutans* appears to have arisen from hybridization (or introgression) between *L. aridus* or *L. lepidus* and *L. leucophyllus*. The flower structure is similar to that of *L. aridus* but the flowers are larger, while the shaggy pubescence and the size of the leaflets appear to have been derived from *L. leucophyllus*. The plant, however, appears to have become stabilized and now has been found in White Pine and Nye counties, Nevada, and in Coconino County, Arizona (*J. T. Howell 26610*, CAS). Neither of the potential parent species occurs in southern Nevada or Arizona. There are then three additional collections which extend the range across the Great Basin, an area rather poorly collected. Since specimens from these later collections are all virtually identical with the Leiberg specimen, I believe the plant requires recognition. It does belong to the group *Lepidi* of *Lupinus*, however, and its final status will require evaluation through breeding studies. A description has been given recently by me in Contributions to a Flora of Nevada, No. 39, p. 56 (1956).

Relicts of Lupinus, group Micranthi

At the time I did the monographic work and the breeding studies on the Pacific Coast species of the group *Micranthi* of *Lupinus*, I was not aware that *L. guadalupensis* Greene non C. P. Sm. (Bull. Calif. Acad. i. IV. 184, —1885) and *L. aliclementinus* C. P. Sm. (Sp. Lup. 408, —1944) belonged to the *Micranthi*. In discussing the phylogeny of the *Micranthi* (El Aliso 3: 136–143, —1955), I suggested that the Mexican members of the group had been isolated too long and that evolution had progressed too far to be able to point to their nearest relative among the present plants of the west coast. I also suggested that *L. affinis* appeared to be the oldest species of the west coast members of the group.

The two plants referred to above appear to be relicts of that

missing link between the Mexican and the west coast species. Isolated today on Guadalupe Island, off the coast of Lower California, and on San Clemente Island, California, respectively, they are very close morphologically and may ultimately prove inseparable. Morphologically they are intermediate in some vegetative characters between *L. nanus* and *L. affinis* and they resemble also the Mexican species in some vegetative characters. They have large pods corresponding to those of *L. affinis* but with the characteristics of tapered ends of pods, pubescence of pods, and angle of the seeds within the pods that resemble these features of the Mexican species, now restricted to mountain peaks. Their survival in more mesic sites, such as those of the islands, might have been anticipated. If any botanist collects specimens from either island, I would very much appreciate seed material so that breeding studies can be conducted. Material seen to date is limited. LUPINUS GUADALUPENSIS: *E. L. Greene,* Apr. 23, 24, 1885 (CAS, UC); *Brandegee,* Mar. 20, 1897 (UC). LUPINUS ALICLEMENTINUS: *P. A. Munz 6741* (POM); *Reid Moran 587* (DS).

NEW RECORDS OF COMPOSITAE IN CALIFORNIA

JUNE MC CASKILL AND WILLIAM A. HARVEY
University of California, Davis

The first record of *Coreopsis Atkinsoniana* Dougl. occurring as a weed in California was established in November, 1953, when specimens of the plant were brought into our herbarium for identification by the junior author who had noted this unfamiliar plant covering extensive areas in Stanislaus County. Heretofore this species had been reported as occurring from Saskatchewan and British Columbia to South Dakota, northern Arizona, and Oregon.

Another composite collected in the same area was identified as *Helenium tenuifolium* Nutt. This species is native to the eastern and southern United States and has been reported as an introduced plant in Marin County by Mr. J. T. Howell in his Marin Flora.

A more extensive survey of Stanislaus County and the surrounding area made in July, 1956, revealed that the infestation of *Coreopsis Atkinsoniana* extended throughout the central por-

tion of Stanislaus County and north into the southern part of San Joaquin County. The plants most frequently occurred in neglected pastures, along roadsides, in irrigation ditches, and in abandoned yards. They were most prevalent in wet soil, but also were thriving in dry, sun-baked soil. Collections of the *Coreopsis* were made from a wet ditch along Eleanor Road approximately 1 mile south of Patterson Road (about 7 miles northeast of Modesto) and again in a dry, neglected pasture beside Grayson Road just west of Laird Road (about 7 miles southwest of Modesto) in Stanislaus County. It is interesting to note that the plants growing at the Grayson Road station had ray corollas varying from the usual yellow with brown-purple bases through various combinations of yellow and brown-purple to solid brown-purple.

At the second station for the *Coreopsis* a collection of *Helenium tenuifolium* was made. This site was the only locality where the *Helenium* was found. Neither this plant nor the *Coreopsis* appeared to be competing with cultivated crops, but were spreading only in neglected areas and were only residual in cultivated fields.

As far as we are able to determine, these occurrences of *Coreopsis Atkinsoniana* constitute a new record for California and the occurrence of *Helenium tenuifolium* in Stanislaus County is an extension of its range in California.

We wish to thank Dr. S. F. Blake for kindly confirming the identification of both species and Mr. E. E. Stevenson, Stanislaus County Farm Advisor, for aiding in the search for these species in his county.

Specimens of the *Coreopsis* collections (*Harvey,* November 1953, *Harvey & McCaskill 504,* and *Harvey & McCaskill 505*) and of the *Helenium* (*Harvey,* November 1953, and *Harvey & McCaskill 506*) are on file in the herbarium of the Botany Department of the University of California at Davis, and duplicate material will be distributed in the near future.

A CORRECTION. Following the usage in Das Pflanzenreich IV. 130 (p. 233), we have been consistently incorrect in this journal in using the epithet *Smallii* instead of *Smalliana* in references to *Oxalis Smalliana* R. Knuth. The name first published on page 185, vol. 7, should be **Oxalis oregana** var. **Smalliana** (R. Knuth) M. E. Peck (as has been noted in the Gray Herbarium Catalogue issue No. 220).—J. T. HOWELL.

THE SANTA YNEZ THERMOPSIS

BY JOHN THOMAS HOWELL

On several occasions Mr. Henry M. Pollard has collected specimens of a large form of *Thermopsis macrophylla* H. & A. which grows on the crest of the Santa Ynez Mts. near Santa Barbara, California. The plants have been found in clearings in the chaparral along the summit road, Camino Cielo, forming "large clumps of near-shrub size" and reaching a height of about 6 feet. Since this plant differs not only in size but also in certain technical details from typical *T. macrophylla,* it is here named as a new variety.

Thermopsis macrophylla H. & A. var. **agnina** J. T. Howell, var. nov. Herba robusta ad 2 m. alta; caulibus crassis ad 1.2 cm. diametro; foliolis tenuiter villoso-pubescentibus utrinque, ellipticis vel obovatis, obtusis vel acutis, ad 11.5 cm. longis, stipulis ad 9 cm. longis; inflorescentiis usque ad 5 dm. longis; calycibus laxe pubescentibus, 7 mm. longis, lobis inferioribus deltoideis, 3.5–4 mm. longis; corollis circa 2 cm. longis; leguminibus erectis, 3.5–5 cm. longis, seminibus 4–6.

Collections, all by Henry M. Pollard from the vicinity of Santa Ynez Peak, Santa Ynez Mts., Santa Barbara County, California: about 1 mile west of Santa Ynez Peak, elev. about 3500 ft., June 27, 1955 (type, CAS, flowers and fruits); small colony seeding vigorously after Refugio Pass burn of 1955, Santa Ynez Peak, elev. about 4000 ft., May 16, 1956 (seedlings and flowers), May 23, 1956 (flowers); near Santa Ynez Peak, Jan. 15, 1956 (seeds).

The original collection of *T. macrophylla,* made by David Douglas somewhere in coastal California, was originally described with leaflets glabrous above and with lower lobes of the calyx lanceolate-subulate (Bot. Beechey, p. 329). The Santa Ynez *Thermopsis* differs from the typical plant in these details and probably also in the height of the plant which more than twice exceeds the dimensions usually given for the species. In the herbarium of the California Academy of Sciences the only specimens corresponding to the points of the original description noted above are three specimens collected near Aromas, San Benito County, by Miss Eastwood *(No. 4205)* in April, 1915, and by J. B. Hickman in May, 1915 (but neither in these collections nor in the original description is the height of the plant indicated). We know that Douglas visited San Juan Bautista on at least one occasion (cf. Leafl. West. Bot. 3:161), and, since Aromas is not far distant, it would have been quite possible for him to

have made the type collection of *T. macrophylla* in present-day San Benito County. Miss Eastwood has already stated that the type may have been collected in the Santa Cruz Mts. near Glenwood (Zoe 5:76–78, —1900), but a specimen collected at Glenwood in 1907 by Horace Davis (CAS) has the upper leaf-surface sparsely and evenly pubescent.

Although no recent description allows a western *Thermopsis* a height of 4 feet, a plant "4 to 6 feet high" was described from northern California by Thomas Howell in 1893 as *T. robusta.* In spite of the fact that M. M. Larisey includes this tall plant in typical *T. macrophylla* (Mo. Bot. Gard. Annals 27:255, —1940), she gives the height of that species as only 4 to 6 dm.

SCIRPUS SAXIMONTANUS IN CALIFORNIA. During the summer of 1952, Henry M. Pollard made three collections of *Scirpus saximontanus* Fernald on the drying margin of Mirror Lake, a small pond in Ojai Valley, Ventura County, California. There the plant grew abundantly for that one year when it was collected on June 28, July 8, and August 12, but, according to Mr. Pollard, it has not since been seen. Among the many marsh plants found by Mr. Pollard at Mirror Lake when he was collecting *Scirpus* in 1952, the following may be noted: *Isoetes Howellii, Marsilea vestita, Sagittaria Sanfordii, Najas guadalupensis, Cyperus acuminatus, Hemicarpha micrantha, Rorippa palustris, Ludwigia palustris,* and *Verbena bracteata.*

On October 24, 1954, yet another California collection of *S. saximontanus* was made, this time by Ernest C. Twisselmann in Kern County: 8 miles north of U. S. Highway 466 on the Corcoran highway, *Twisselmann 1642.* Mr. Twisselmann notes that the plant was "scarce, growing in drying mud of a small fresh water pool."

Although Beetle (N. Amer. Fl. 18: 498) treats *S. saximontanus* as a synonym of *S. supinus* var. *Hallii* (Gray) Gray, I prefer to follow Fernald (Gray's Manual, ed. 8, 268), not only in separating specifically the European and American plants of this relationship, but also in distinguishing the distigmatic *S. Hallii* Gray from the tristigmatic *S. saximontanus.* The latter, according to Fernald, is distributed from "Colo. to Mex., e. to S. D., Neb., Kans. and Tex.; Pickaway Co., O." I have not seen a report of the plant for any western state.—JOHN THOMAS HOWELL.

GLYCERIA DECLINATA IN STANISLAUS COUNTY, CALIFORNIA. On May 11, 1953, I collected *Glyceria declinata* Brébisson *(G. Cookei* Swallen) from a vernal pool 2 miles south of Oakdale on the road to Waterford, Stanislaus County, California, my *No. 1247*. This, I believe, is a new locality within the state and rather far removed from the moist canyons and meadows of northern California whence this European plant has been known earlier. My determination has been confirmed by J. R. Swallen at the U. S. National Herbarium.—BEECHER CRAMPTON, University of California, Davis.

GUIZOTIA SPONTANEOUS IN CALIFORNIA. The African annual, *Guizotia abyssinica* (L.f.) Cas., has been found growing as a garden weed in San Francisco *(Eastwood in 1932)* and as a weed of waste ground in Santa Barbara *(Pollard in 1956)*. In California, it most closely resembles species of *Bidens* from which it may be distinguished by the broad, erect, herbaceous, outer involucral bracts, the fertile ray-flowers, and the epappose achenes. One may wonder how this exotic sunflower, which is widely cultivated in India for the oil of its achenes, has appeared in California. A possible clue is suggested by H. F. Macmillan, who reports that its seed is "commonly used as food for cage birds" (Tropical Gardening and Planting, ed. 3, p. 396). So far we have no evidence that this plant will become naturalized.—JOHN THOMAS HOWELL.

CHENOPODIUM VULVARIA IN CALIFORNIA. Although *Chenopodium Vulvaria* L. is widespread and locally common in northern California, each of the records of Greene (Fl. Fran. 165, —1891), Abrams (Fl. Pac. States 2:70, —1944), and myself (The Gull 25:23, —1943) concerns only single occurrences. The following California collections of this evil-smelling weed, which certainly deserves full floristic recognition in the state, are in the California Academy of Sciences Herbarium: Yreka, Siskiyou Co., *L. C. Wheeler 3307* in 1934; Experiment Station, Chico, Butte Co., *Eastwood in 1913;* along Putah Creek near Davis, Solano Co., *Crampton 3583* in 1956; lower part of Arroyo Mocho, Alameda Co., *Howell 18111* in 1943; Turlock, Stanislaus Co., *Chester Dudley in 1947*.—JOHN THOMAS HOWELL.

Vol. VIII No. 7

LEAFLETS *of* WESTERN BOTANY

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AUGUST 16, 1957

LEAFLETS
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JOHN THOMAS HOWELL

A TENTATIVE KEY TO THE SOUTH AMERICAN SPECIES OF HIBISCUS, L.

BY THOMAS H. KEARNEY (†)

The genus *Abelmoschus* Medic. is excluded, although it was included in *Hibiscus* (as a section) by Hochreutiner in his monograph of that genus (Ann. Conserv. et Jard. Bot. Genève 4: 32, 49–51, 148–156). Juxtaposition of species in this artificial key does not necessarily indicate close relationship. The notes will be found at the end of the key. Note 1.

1. Plants arborescent or large shrubs, litoral; leaves large, broadly ovate or suborbicular, often wider than long, coriaceous, discolorous, abruptly and shortly acuminate, deeply cordate at base, the margin entire or finely crenulate. Bractlets of the involucel 8 or more, united below; flowers large, the petals 6 cm. or longer, yellow fading greenish. Widely distributed on the coasts of South America..... .....*H. tiliaceus* L. Note 2

1. Plants not arborescent and litoral, or the leaves otherwise (2).

2. Mature leaves, some or all of them, palmately cleft to far below the middle, or parted. Plants herbaceous; bractlets sometimes appendaged at apex; calyx, especially in fruit, with conspicuously thickened nerves and margins. Old World species, often cultivated but scarcely naturalized in South America (3).

2. Mature leaves (except sometimes in *H. bifurcatus, H. cisplatinus, H. diversifolius, H. furcellatus, H. ingratus,* and *H. insignis)* not lobed or less deeply lobed (4).

3. Involucel and calyx becoming fleshy and dark red or purple; herbage glabrous or nearly so; leaf-lobes serrulate or crenulate; calyx-hairs soft and fine, not conspicuously pustular-based; corolla yellow..... .....*H. Sabdariffa* L. Note 3

3. Involucel and calyx not becoming fleshy, remaining green; herbage often more or less hispid; leaf-lobes coarsely toothed; calyx-hairs stiff and relatively coarse, from a conspicuously pustular base; corolla yellow or occasionally red, with a dark center.....*H. cannabinus* L. Note 4

4. Bractlets bifurcate, sometimes very unequally or obsoletely so. Plants usually shrubby; calyx-lobes with a more or less conspicuous median gland; petals 4–9 cm. long, pink, crimson, or purple (5).

4. Bractlets not bifurcate (12).

5. Stems normally aculeate. Bractlets 8 or more (6).

5. Stems not aculeate but sometimes (in *H. furcellatus)* more or less setose. Bractlets commonly about ½ as long as the calyx (8).

6. Stems usually hispid with long, spreading or retrorse, simple hairs, these borne on the prominent aculei or on smaller, pustular bases; petals 6–9 cm. long. Leaves mostly 3–5-lobed, often deeply so, serrate; in-

(†) At the time of his death on Oct. 19, 1956, Dr. Kearney left several completed manuscripts dealing with the taxonomy of *Malvaceae.* Through the interest and generosity of his friends, a fund has been collected under the auspices of the California Academy of Sciences to meet in part the expense of publishing these papers. The first one is presented here and others will appear in subsequent numbers of this journal.—J. T. Howell.

Leaflets of Western Botany, Vol. VIII, pp. 161–180, August 16, 1957.

volucel and calyx hirsute or hispid with long simple hairs. Colombia, Guiana, Brazil; North America.....*H. bifurcatus* Cav. Note 5

6. Stems without such long hairs, the aculei minute and more or less recurved; petals about 9 cm. long (7).

7. Leaves glabrous or glabrescent, sometimes 3-lobed with lanceolate, acuminate lobes; bractlets deeply bifurcate, with arms of nearly equal length, the bractlets and calyx hispid with long hairs. Guiana..... .....*H. varians* Splitg.

7. Leaves minutely pubescent on the nerves, mostly angulately 3-lobed, the upper ones sometimes triangular to narrowly lanceolate and not lobed; bractlets shallowly bifurcate with one arm much longer than the other, the bractlets and calyx tomentellous. Peru..... .....*H. peruvianus* R. E. Fries

8. Upper leaves greatly reduced, the inflorescence appearing as a naked raceme; leaves not lobed but (in *H. flagelliformis*) somewhat angulate (9).

8. Upper leaves (in *H. kitaibelifolius*?) not greatly reduced and the inflorescence not appearing as a naked raceme; leaves mostly lobed or angulate, often nearly or quite as wide as long but sometimes (in *H. furcellatus*) much narrower, cordate or subcordate at base. Bractlets shallowly bifurcate; petals 6–9 cm. long (11).

9. Bractlets 11–13; leaves broadly ovate or suborbicular or the upper ones subrhombic, denticulate; petals 7–8 cm. long. Brazil..... .....*H. trilineatus* St. Hil. & Naud.

9. Bractlets 8–10; leaves more or less reniform, mostly wider than long, rather coarsely and sharply dentate; petals 4–6 cm. long (10).

10. Leaves subangulate; petals pale pink. Stems prostrate. Brazil..... .....*H. flagelliformis* St. Hil.

10. Leaves rounded; petals red. Brazil.....*H. Pohlii* Guerke

11. Stems usually velutinous with minute, stellate hairs, sometimes also more or less setose; leaf-lobes obtuse or acutish, or the leaves not lobed; capsules usually villous or sericeous. Leaves narrowly ovate to suborbicular. Colombia, Venezuela, Guiana, Brazil, Paraguay, Peru, Bolivia, Argentina; North America.....*H. furcellatus* Desr. Note 6

11. Stems hirsute or villous with long, simple hairs, also shortly stellate-pubescent; leaf-lobes acute; capsules glabrous. Brazil..... .....*H. kitaibelifolius* St. Hil.

12. Involucel-bractlets conduplicate, with a subcylindric, stalk-like basal portion and a broad blade, 8–10 in number. Plants suffrutescent to shrubby; leaves broad; petals erect or only slightly spreading, pink or purple (12a).

12. Involucel bractlets otherwise (13).

12a. Bractlets less than ½ as long as the calyx, abruptly dilated into a rounded, subreniform blade, this shorter than the stalk; stems stellate-hirsutulous; leaves not lobed, at most slightly angulate, crenulate; calyx-lobes obtuse or acutish; petals 3.5–6 cm. long; capsules hirsute externally; seeds minutely tuberculate, otherwise glabrous. Venezuela, Guiana, northern Brazil, Bolivia, northern Argentina... .....*H. sororius* L. f. Note 7

12a. Bractlets ⅔ as long as to nearly equaling the calyx, expanded into an ovate, acuminate blade, this much longer than the stalk; stems minutely stellate-pubescent; leaves shallowly 3–5-lobed with broad, rounded lobes, sparingly crenate; calyx-lobes attenuate-acuminate; petals 6–7 cm. long; capsules scurfy-puberulent externally; seeds densely lanate. Ecuador and Peru.....*H. Hitchcockii* Ulbr. Note 7a

13. Bractlets 4, broadly ovate, cordate, 5–9-nerved, accrescent, up to 2 cm. long. Stems shortly stellate-tomentose and with long, simple, rigid hairs; leaves broadly ovate, subangulate, coarsely serrate; calyx somewhat longer than the involucel; petals yellow with a dark red basal spot, about 6 cm. long; capsules about ⅔ as long as the calyx, densely hispid. Northern Brazil and perhaps in British Guiana.....
.....*H. dimidiatus* Schrank

13. Bractlets more numerous and narrower (14).

14. Aculei (except in *H. ferox* var. *metensis*) present on the herbage or at least on the peduncles (15).

14. Aculei absent (24).

15. Leaves usually considerably longer than wide. Bractlets subulate or filiform; capsules hirsute or hispid (16).

15. Leaves from wider than long to slightly longer than wide, long-petiolate. Bractlets much shorter than the calyx, the involucel and calyx more or less hirsute or hispid (20).

16. Blades mostly lobed. Herbage sparsely (rarely copiously) pubescent, or glabrate; calyx tubular-campanulate; petals 6–9 cm. long (17).

16. Blades not lobed or sometimes (in *H. Lambertianus)* subhastately so (18).

17. Involucel usually much shorter than the calyx, the bractlets and calyx sometimes sparsely hirsute; hairs of the lower leaf-surface mostly stellate and minute but apparently sometimes simple and longer; leaf-blades commonly at least twice as long as wide, mostly subhastately to deeply and palmately 3–5-lobed; peduncles mostly 2–4 cm. long; petals rose-purple with a darker basal spot. Southern Brazil, Paraguay, Uruguay, Argentina.....*H. cisplatinus* St. Hil. Note 8

17. Involucel about equaling the calyx, the bractlets and calyx hispid; hairs of the lower leaf-surface simple or the leaves sometimes glabrous on both surfaces; leaf-blades less than twice as long as wide, mostly deeply 3-lobed; peduncles up to 9 cm. long; petal color unknown. Guiana and perhaps in Brazil.....*H. ingratus* Miq.

18. Leaves about twice as long as wide; involucel and calyx hispid; bractlets somewhat shorter than the calyx, arcuate-spreading; petals 8–10 cm. long, the color unknown. Seeds glabrous. Brazil, Uruguay.....
.....*H. amoenus* Link & Otto

18. Leaves mostly 3 or more times as long as wide; involucel and calyx usually more or less hirsute or hispid; bractlets much shorter than the calyx; petals pink or purple with a darker basal spot (19).

19. Blades mostly 3 times as long as wide, crenate or crenate-serrate, sometimes subhastately lobed; bractlets 14–18; petals (6?) 9–11 cm. long; seeds hairy. Colombia, Venezuela, Brazil, Paraguay, Uruguay, Argentina; North America.....*H. Lambertianus* H. B. K. Note 9

19. Blades 5 or more times as long as wide, serrate, not lobed; bractlets 10–12; petals 7–9 cm. long; seeds presumably glabrous. Brazil, northern Argentina.....*H. linearis* St. Hil. & Naud.

20. Petals 4–5 cm. long, commonly yellow; calyx campanulate, the lobes about as long as the tube. Leaves very diverse, suborbicular to oblong-ovate, often 5-lobed or 5-parted, long-petiolate, the upper leaves much reduced and the inflorescence thus appearing as a terminal, spike-like raceme; peduncles short; bractlets 8–10, these and the strongly nerved calyx thick, more or less verrucose; capsules hispid. Colombia, Brazil; North America; perhaps introduced from the Old World.....
.....*H. diversifolius* Jacq. Note 10

20. Petals 6 cm. or longer; calyx more or less tubular, the lobes shorter than the tube (21).

21. Leaves not lobed, aculeate and tomentose beneath, discolorous; pistil long-exserted. Petioles, peduncles, and calyx aculeate; peduncles 20 cm. or longer; petals red, up to 11.5 cm. long. Colombia.....
.....*H. pseudoferox* Hochr.

21. Leaves usually more or less angulate or lobed; pistil not or only moderately exserted (22).

22. Petals pink or purple with a darker colored basal spot, 7–8 cm. long; leaves 3- or obscurely 5-lobed, deeply serrate, hispid on both surfaces. Plants shrubby or arborescent; bractlets 12–14, hirsute; calyx-lobes broad, rounded and apiculate at apex; capsules about ½ as long as the fruiting calyx, hispid with yellowish hairs. Guiana; West Indies.
.....*H. trilobus* Aubl. Note 11

22. Petals yellow; leaves commonly 5–7-lobed or -angulate, suborbicular. Calyx hispid, the lobes much shorter than the tube; petals about twice as long as the calyx, spreading or reflexed apically (23).

23. Peduncles, stems, and leaf-veins aculeate with stout, basally flattened spines, or (in var. *metensis* Tr. & Planch.) hispid but not aculeate; plants shrubby or arborescent; peduncles at anthesis 1–3 cm. long; bractlets 7–10, lanceolate or ovate-lanceolate, hispid. Leaves up to 25 cm. long and wide, cordate; calyx at anthesis 4–5 cm. long, in fruit up to 13 cm. long. Colombia, Ecuador and perhaps Bolivia; Costa Rica.....*H. ferox* Hook.

23. Peduncles, but not the stems and leaves, aculeate; plants herbaceous, tall; peduncles (at anthesis?) 7–11 cm. long; bractlets 11 or 12, lanceolate, stellate-hirsute. Ecuador.....*H. trichromathus* R. E. Fries

24. Calyx-lobes with an oblong or circular median gland (25).

24. Calyx-lobes (except perhaps in *H. setifer)* not glandular. Bractlets subulate (29).

25. Bractlets 10 or more, linear-subulate or narrowly oblanceolate, hirsute or hispid (26).

25. Bractlets 9 or fewer, much shorter than the calyx. Petals 4–6 cm. long (27).

26. Stems densely pubescent with rigid, spreading, stellate hairs; leaves orbicular or broadly ovate, typically obtuse (acuminate in var. *acuminatus* Hassler), rather shallowly crenate-dentate, sometimes obscurely 3–5-lobed; bractlets about ½ as long as the calyx. Petals 5–6 cm. long (up to 8 cm. in var. *acuminatus*), pink with a red basal spot. Southern Brazil, Paraguay.....*H. cucurbitaceus* St. Hil.

26. Stems pubescent with mostly simple hairs; leaves ovate, acuminate, conspicuously doubly serrate; bractlets only slightly shorter than the calyx. Petals not described but apparently about 6 cm. long. Southern Brazil.....*H. urticaefolius* St. Hil. Note 12

27. Stems densely tomentose with minute, stellate hairs. Flowers often in a nearly leafless raceme or thyrse at end of the stem and branches; bractlets 6 or 7, subulate, not more than ½ as long as the calyx, united toward base; petals rose, about twice as long as the androecium. Brazil.....*H. Henningsianus* Guerke

27. Stems hirsute or roughly stellate-pubescent (28).

28. Flowers in a more or less racemose or paniculate inflorescence, with the uppermost leaves greatly reduced or aborted; leaves suborbicular, broadly ovate, or subrhombic, more or less denticulate, subcordate to cuneate at base; petals pink with a purplish base. Bractlets often more or less reflexed. Brazil.....*H. laxiflorus* St. Hil.

28. Flowers solitary in the axils; leaves subreniform, much wider than long, coarsely crenate-dentate, subcordate at base with a very open sinus; petals rose-pink. Paraguay.....*H. Hasslerianus* Hochr.

29. Petals not more than 2 cm. long. Plants shrubby or suffrutescent; stems glabrous or sparsely pubescent; leaves thin, coarsely toothed, more or less acuminate; bractlets 9–11, narrowly linear or nearly filiform, equaling (rarely shorter) to much longer than the calyx (30).

29. Petals (except perhaps in *H. setifer*) not less than 3 cm. long (31).

30. Leaves 3–6(9?) cm. long, 2/5 to equally as wide as long, deltoid-ovate or deltoid-lanceolate, truncate, obtuse, or subcuneate at base, often shallowly lobed; petals normally crimson; seeds with long white hairs. Colombia, Venezuela, and perhaps in Brazil; North America.....
.....*H. brasiliensis* L. Note 13

30. Leaves 15 cm. or longer, ⅓ as wide as long, ovate-oblong and subrhombic, not lobed; petals (as described) violet; seeds not described. Brazil (Amazon Valley).....*H. Cavanillesianus* H. B. K.

31. Stems hirsute with long (up to 5 mm.), simple, mostly retrorse hairs, and with a decurrent, tomentose line. Leaves cordate with a closed sinus, tomentose on both surfaces, discolorous, 3–5-lobed, the midlobe elongate, attenuate-acuminate; stipules subulate, becoming reflexed; bractlets 15, setaceous, tomentose and densely ciliate; flowers and fruit unknown. Presumably from Ecuador...*H. setifer* Presl. Note 14

31. Stems glabrous or the hairs much shorter or not simple (32).

32. Herbage glabrous or nearly so (33).

32. Herbage very pubescent (36).

33. Petals deeply laciniate with numerous oblong or spatulate lobes, pink or crimson. Plants shrubby; leaves ovate to oblong-lanceolate; flowers on very long, slender peduncles; bractlets minute, many times shorter than the tubular, shallowly lobed calyx; androecium slender, greatly surpassing the corolla. An Old World species, often cultivated and frequently escaping in northern South America, apparently naturalized in Peru .....*H. schizopetalus* (Mast.) Hook. f.

33. Petals not laciniate (34).

34. Leaves subsessile or very shortly petiolate, lanceolate, the margins entire or sparingly dentate; bractlets 9, subulate, much shorter than the

calyx; petals dorsally farinose. Capsules villous at apex. Brazil (Matto Grosso).....*H. glabrifolius* St. Hil. & Naud. Note 15

34. Leaves mostly distinctly (often long-) petiolate, broader, rather coarsely toothed; bractlets fewer, linear to subulate; petals not farinose, usually with a darker basal spot. Plants shrubby or arborescent. Old World species, extensively cultivated and sometimes escaping (35).

35. Blades up to 15 cm. long, commonly broadly ovate, truncate or subcuneate at base; bractlets 5 or 6, about ½ as long as the calyx; petals 6–8 cm. long, bright red; androecium often long-exserted.....*H. Rosa-sinensis* L. Note 16

35. Blades up to 8 cm. long, rhombic-ovate, cuneate at base, mostly 3-lobed; bractlets 6–8, equaling or somewhat longer than the calyx; petals 3–6 cm. long, pink or white; androecium not exserted.....*H. syriacus* L.

36. Petals (in *H. insignis*?) 10 cm. or longer (37).

36. Petals not more than 8 cm. long. Calyx somewhat accrescent and bladder-like after anthesis (38).

37. Leaves mostly deeply 3-lobed, the lobes cuspidate-acuminate; involucel much shorter than the calyx, shortly 8-dentate; petals yellow tinged with pink, with a purple basal spot; capsules hirsute.....*H. insignis* Mart. Note 17

37. Leaves not lobed, ovate, subcordate or obtuse at base, up to 25 cm. long; involucel about ¾ as long as the calyx, of 8 or 9 subulate, distinct bractlets; petals white, with suborbicular blades somewhat shorter than the very long claws; fruit unknown. Brazil.....*H. Peterianus* Guerke

38. Bractlets 13 or more, subulate, thick, hispid, ⅔–¾ as long as the calyx; flowers solitary in the axils; leaves lanceolate or ovate-lanceolate, ¼–½ as wide as long, obtuse or subcordate at base, rather coarsely serrate-dentate; petals (6?) 7–8 cm. long, normally red with a darker colored basal spot; capsules hirsute. Herbage stellate-tomentose; calyx membranous, hirsute. Brazil, Paraguay, northern Argentina.....*H. Selloi* Guerke. Note 18

38. Bractlets fewer and broader; flowers often subcorymbosely aggregated at apex of the stem and branches; leaves nearly as wide as to wider than long, usually angulate or shallowly lobed, cordate; petals 4–6 cm. long; capsules hispid (39).

39. Herbage more or less pubescent with minute, stellate hairs, often also with glandular hairs; leaves long-petiolate, the lobes acutish to acuminate; bractlets 6–8, narrowly to broadly lanceolate; calyx tomentose; petals spreading, pink, or white fading pink; seeds lanate-hispid. Brazil, Peru, perhaps only cultivated; native of tropical Asia.....*H. mutabilis* L.

39. Herbage hispid-tomentose with longish, forked or stellate hairs; leaves shortly petiolate; bractlets 9 or 10, spatulate, 3–4 mm. wide; calyx somewhat hirsute; petals erect, pink or purple; seeds puberulent. Guiana, northern Brazil; Panama.....*H. verbasciformis* Klotzsch. Note 19

NOTES

1. The following plants, some of which may not belong to the genus *Hibiscus* as now restricted, are too poorly known for inclusion in this key: *H.*

apricus Vell. (Brazil), *H. axillaris* Vell. (Brazil), *H. fugax* Mart. ex Spreng. (Brazil), *H. geminiflorus* Ernst (Venezuela), *H. Joungianus* Tr. & Planch. (Colombia?), *H. prunifolius* F. G. Dietr. (Guiana), *H. quinquelobatus* Vell. (Brazil), *H. submaritimus* Larrañaga (Uruguay).

2. Synonyms: see key to the Northern American species, Note 3 (Leafl. West. Bot. 7:281). I. M. Johnston (Sargentia 8: 195–196) distinguished var. *abutiloides* (Willd.) Hochr. in northern South America and var. *pernambucensis* (Bertol.) Johnst. (*H. pernambucensis* Bertol.) on the coast of Brazil south of the Amazon, the latter with a merely dentate involucel.

3. Synonyms: see key to the North American species, Note 5 (Leafl. West. Bot. 7:282).

4. Synonym (or variety?): *H. radiatus* Cav., a form with usually appendaged bractlets.

5. Synonyms: see key to the North American species, Note 10 (Leafl. West. Bot. 7:282).

6. Synonyms: see key to the North American species, Note 11 (Leafl. West. Bot. 7:282). In var. *dominicus* (Hochr.) Hassler (*H. dominicus* Hochr.) the herbage is copiously setose (subaculeate). In var. *multiformis* (St. Hil.) Guerke (*H. multiformis* St. Hil.) the capsules are glabrous (Fl. Bras. 12^3: 563).

7. Synonym: *H. crenatus* Splitg. non Vell.

7a. Leafl. West. Bot. 7:271.

8. This polymorphic species apparently intergrades with *H. Lambertianus*. Rodrigo (Rev. Mus. La Plata ser. 2, 7: 137, 139) cited the following as synonyms: *H. argentinus* Speg., *H. Lambertianus* var. *lobatus* Chod. & Hassler, *H. Lindmanii* Guerke. The last was described as having broad, deeply lobed leaves and non-aculeate stems.

9. *H. salviaefolius* St. Hil. was cited as a synonym by Rodrigo (ibid. p. 132). Hochreutiner (Ann. Genève 4: 143) distinguished two varieties, var. *genuinus* Hochr. and var. *angustifolius* (Hook. & Arn.) Hochr. (*H. angustifolius* Hook. & Arn.), the latter characterized by stems, petioles, and peduncles glabrous except for the aculei, and leaves glabrescent. An older varietal name for this plant is var. *glaber* Guerke (Fl. Bras. 12^3: 552).

10. Synonyms: see key to the North American species, Note 22 (Leafl. West. Bot. 7: 282).

11. See key to the North American species for other characters (second key paragraph 31) and synonyms (Note 23) (Leafl. West. Bot. 7: 278, 282). As figured by Cavanilles (Diss. t. 53, fig. 2), the calyx is broadly tubular, with broad lobes.

12. A photograph of the type of this little-known plant shows only upper leaves, none of which is lobed, although Hochreutiner (Ann. Genève 4: 118) described the leaves as obtusely trilobate. Two species may be represented in this photograph, the right-hand portion having, apparently, bifurcate bractlets.

13. Synonyms: see key to the North American species, Note 26 (Leafl. West. Bot. 7: 283).

14. The status of this plant is uncertain. It may not belong to the genus *Hibiscus* as now understood. Hochreutiner (Ann. Genève 4: 176) listed it as "sp. dub."

15. The length and color of the petals were not mentioned in the authors' description.

16. Several varieties have been described. Synonym: *H. pulcherrimus* Speg., according to Rodrigo (Rev. Mus. La Plata ser. 2, 7: 149).

17. Possibly an Old World species, although reported from Brazil. See Fl. Bras. 12^3: 555 and Hochreutiner's Monograph (Ann. Genève 4: 122, 123).

18. Rodrigo's description (Rev. Mus. La Plata ser. 2, 7: 129-131) differs in some respects from Guerke's (Fl. Bras. 12^3: 553). In var. *paraguariensis* Chod. & Hassler, the petals were described as white or pale pink.

19. In Fl. Bras. (12^3: 547) *H. verbasciformis* was described under the untenable name *H. spathulatus* Garcke, non Gaudich.

A NEW SPECIES OF LAPHAMIA FROM NEW MEXICO

BY R. C. BARNEBY
Wappingers Falls, New York

Laphamia staurophylla Barneby, spec. nov., inter congeneres pappo 2–6-setoso necnon foliis palmatim, fere cruciatim tripartitis insignis.

Suffruticulus humilis diffusus fere undique puberulus nunc inferne glabratus, nunc superne minutim atomifero-resinosus; caules annotini herbacei fragiles e trunco valido nodoso vel e caudice breviter ramuloso emissi 5–20 cm. longi, infra inflorescentiam laxe cymoso-paniculatam (1) 3–13-capitulatam simplices; folia (in vivo crassiuscula subsucculenta) caulina opposita cum petiolo elongato 7–35 mm. longa, majora palmatim tripartita, laciniis ambitu oblanceolatis vel spatulatis deorsum attenuatis, integris vel saepius 1–4-dentatis -lobatisve, in bracteas alternas lineares vel spatulato-trilobas abeuntia; pedunculi 3–15 mm. longi, anguste clavati; involucri campanulati 4–4.8 mm. longi squamae circa 14 oblongo-oblanceolatae obtusae vel acutiusculae dorso carinatae concavae apicem versus villosulae atque ciliolatae; receptaculum convexum alveolatum; capitula radiata circa 30–35-flora; radii pauci (1–4), lamina oblongo-obovata tricrenata 3.5–4 mm. longa aurea (nunc in sicco albescenti); disci corollae 3–4 mm. longae, fauce cylindracea tubum angustiorem glandulosum superanti; achaenia oblonga compressa vel obscure tetragono-compressa nigra 1.7–2.2 mm. longa, margine carinata sed vix incrassata, parce puberula, ciliolata; pappus simplex, e setis 2–6 minute scaberulis, singula (nonnumquam 2) ex utroque angulo 1.2–2.1 mm. longa, aliis (ubi adsunt) plerumque brevioribus ex intervallo passim ortis.

New Mexico: crevices of dry, north-facing limestone cliffs, and in cracks of massive fallen boulders, elevation about 6300 ft., La Luz Canyon below High Rolls, on the western slope of the Sacramento Mountains, Otero County, 2 September, 1956, *R. C. Barneby 12,889*. Type in Herb. Calif. Acad. Sci., No. 405624; isotypes NY, GH, K, RSA, US, and herb. Univ. New Mex.

On account of the concave involucral bracts and long-cylindric

throat of the disc-corollas, *L. staurophylla* would key to *Leptopharynx* (Rydberg, 1914). However this genus has been shown by Everly (1947, p. 378) to be inadequately characterized and composed, in fact, of a mixture of *Perityle* and *Laphamia.* In her study of generic limits in the group, Everly returned, with minor modifications, to the classic definition of the genera proposed by

Laphamia staurophylla Barneby, spec. nov. Upper left, leaf-outlines; upper right, involucre; bottom, from left to right, achenes, disc-corolla, involucral scale and ray.

Gray (1886, pp. 71 and 319–320), and emphasized the absence of an outer pappus-crown of short squamellae as the one consistent differential character of *Laphamia.* In this sense *L. staurophylla* is unquestionably a true *Laphamia,* although readily distinguished in the genus by the combination of deeply tripartite, almost cruciform leaves and the peculiar pappus composed of two to six bristles.

The form of the pappus is of theoretical interest in that it represents a state somewhat intermediate between that of *Laphamia* "proper" (in Gray's sense) and *Laphamia* sect. *Pappothrix* Gray, a little group of four west Texan and New Mexican species which was elevated by Rydberg to generic rank and lately accepted at the generic level by Everly. The pappus of typical *Laphamia* consists of a narrow naked callous crown with or without

a single bristle (exceptionally two) arising from one or both angles of the achene. In some species the setae vary from one to none, in others from one to two (or three). About half the achenes of *L. staurophylla* are bisetose, that is typically laphamioid; the rest bear anything from one to four subsidiary, commonly shorter bristles arising close to the primary pair or at random points in the intervals between the angles. The pappus of *Pappothrix* consists of some twenty to thirty closely spaced bristles.

Whatever the evolutionary significance of the pappus may be, the general appearance of *L. staurophylla* does not suggest a close relationship to any species of *Pappothrix*. In growth-habit, size and arrangement of the heads, and other details, it resembles the Texan *L. laciniata* (Torr.) Rydb.; but this has oblanceolate, saliently few-toothed leaves, rayless heads, and no pappus. *Laphamia gilensis,* endemic to cliffs along the Salt River and tributary creeks in central Arizona, has some deeply tripartite leaves, but the lobation of the segments is greatly different in pattern, the heads are larger, the rays commonly more numerous, and the pappus consists of but a single bristle.

LITERATURE CITED

EVERLY, MARY LOUISE. 1947. A taxonomic study of the genus Perityle and related genera. In Contrib. Dudley Herb. 3: 375–369.

GRAY, ASA. 1886. Synoptical Flora vol. 2, part 1, Gamopetalae.

RYDBERG, PER AXEL. 1914. N. Amer. Fl. 34: 21–26.

ANENT CORYDALIS CASEANA AND ELIPHALET LEWIS CASE (1843-1925)

BY WILLIAM A. DAYTON
Arlington, Virginia

Fitweed corydalis (*Corydalis Caseana* A. Gray) was published in Brewer, Watson & Gray's "Botany of California" (vol. 1, p. 24, –1876) with the statement that it was named for E. L. Case. This handsome plant, in ornamental cultivation, has caused serious sickness and losses of cattle and sheep in the Plumas National Forest in California. In preparing a manuscript on western range forbs I became interested in learning something about that tragic figure, the eponym of this plant. Having searched in vain among my fairly numerous biographical references, I appealed to the owner and publisher of this journal, John Thomas

Howell, who in turn kindly suggested three possible sources of information. One of these sources, Mr. Allan R. Ottley, California Section Librarian of the California State Library at Sacramento, has very graciously furnished me with the following: (1) a reproduction of an account of Mr. Case's death in The Mountain Messenger of Downieville, California, for November 21, 1925; (2) eleven other (page and date) references to the Downieville Mountain Messenger for 1925 and 1926. I have since obtained from Mr. Ottley 16 photostatic excerpts relating to the last days of Mr. Case. (3) Registration registers of voters in Plumas and Sierra counties, California, for 1872 and 1876, respectively; (4) an excerpt from an "Illustrated History of Plumas, Sierra and Lassen Counties" for 1882. Through the U. S. Department of Agriculture Library, I have been able to obtain two references to the Pacific Rural Press for 1876. Prof. Joseph Ewan of Tulane University kindly wrote on my behalf to Dr. Harold St. John at Honolulu and the latter has furnished two additional details. My warm thanks are extended to Messrs. Howell, Ottley, Ewan, and St. John for their invaluable help, without which this notice could not have been written.

From the above it would appear that Eliphalet Lewis Case was a native of Fredericktown, Knox County, Ohio, and that he served in the Union Army during the latter part of the Civil War. He moved to Sierra Valley, California, after the war and taught in the public schools of Taylorsville and Sierraville. He later moved to Downieville, the county seat of Sierra County, about 1895 and became a member of the Board of School Examiners of the county. In 1902 he was elected Treasurer of Sierra County and served in that capacity, with the exception of one term, until his death. He was an ardent amateur botanist and an intimate associate of the well-known California botanist John Gill Lemmon (1832–1908).

Vol. 11 (1876) of the Pacific Rural Press has six articles by Lemmon under the head "Botanical Excursions", at least three of which have personal references to Case. In the first one (March 4, p. 146) Lemmon writes that, in his "snow-covered retreat at Webber lake, April 8, 1875," he received a letter from "Dr. Geo. Vasey, Botanist of the Agricultural Department in Washington," saying that "Dr. Gray advises me to solicit you to collect specimens of the trees and shrubs of your region . . . for exhibition at the Centennial." He then adds:

"But one can do little collecting alone, so I led my little curly pony,

packed to his ears with plants, back to Sierra valley, and beset in his schoolroom my companion on so many excursions, Prof. E. L. Case, to accompany me out in the great basin to Pyramid Lake — one of the reservoirs or residual seas of this once vast ocean. Thinking of the heavy labor and fierce exposure it involved, the Professor at first hesitated, but by dint of glowing descriptions and strong promises, he kindly consented.

"Stowing our little wagon with bedding, food and great bales of botanical paper, we scampered down the long east side of Sierra valley, 35 miles to Beckwourth pass, through which we emerged into the great Fremont basin, to toil for weeks through its sand, alkali and prickly bushes, revel in its curious and rare flora, gaze upon its grand yet gloomy scenery, and bring away — beside the characteristic products of the basin — a train of vivid, treasured memories of strange scenes and striking adventures in that wonderful sun-scorched land — a veritable tierra caliente!"

In the second of these Pacific Rural Press articles (No. 14, p. 210, April 1, 1876) Lemmon writes:

"We [*i.e.*, Lemmon and Case] took our fill of Humboldt desert in two days and one night. That night was spent out on the rank smelling floor to rid ourselves of the . . . 9,473,608 solid feet of mosquitos, until becoming exhausted, we crowded into the wagon, dropped the curtains, crept under five pairs of blankets, with our boots on and a bake kettle over our heads. . . . The only way we could botanize the plain next day was for me to arm one hand with a bush, and continually whip my face, with the other hand grasp blindly for flowers, while Prof. Case stood over me with a wisp of bushes in each hand, with which he lashed alternately my shoulders and his own. We thus secured a number of rare prizes, among them a fifth new *Astragalus,* which properly bears the name of *Astragalus Casei,* Gray. . . . Returning by the same route to Pyramid Lake . . . Prof. Case amused himself with shooting pelicans. . . . Four rods off I can detect plants two inches high . . . but I see nothing else. . . . Perhaps this is why I have not seen a grizzly bear in all my travels. Case declares, however, that it is because of my inveterate whistling or singing, enough, he says, to frighten a grizzly a half mile away."

Lemmon graphically describes in detail a harrowing ride in a skiff in a succession of squalls on Pyramid Lake, with Case acting as skipper, using a blanket for a sail. "Case, I cried . . . I would as leave go down here as anywhere, and with you as anyone, but think of the trouble it would give to learn our fate. Think of the Odd Fellows. Think of our mothers!" He mentions some of his war experiences, of marching through Georgia and of six months of starvation in Andersonville Prison, but says he was young then and none of this equaled "the row for life on Pyramid Lake and the search for water and food" the following night.

In the third of these Pacific Rural Press articles ("The Northern Valley of Lassen's Peak. Part 1st. Sierra Valley to American Valley. No. 15, p. 226, April 8, 1876) Lemmon writes that, at the request of Asa Gray, "some three years ago I visited Lassen's

peak, on one of my first botanical trips. I was accompanied then, for the first time, by the genial gentleman who has so often been my companion since, Prof. E. L. Case". He adds that they were able to bring back only a few specimens (in a copy of Harper's Monthly) and, among them, was "a very beautiful, sweet-scented *Corydalis,* entirely new to science". Dr. St. John calls my attention to a letter dated January 30, 1874, from Lemmon to Gray in which the writer says: "Should the enclosed Corydalis prove a new species or variety I beg you will honor another of my friends, Prof. E. L. Case of this valley. He is a very good scholar, a pure-minded gentleman, and as modest as he is good. He was with me at the time of its discovery and has accompanied me in nearly all of my ramblings."

In the last of these articles, concluding the Lassen's Peak series (No. 25, pp. 386–7, June 17, 1876), Lemmon writes that, after leaving Hot Springs Valley and the Hot Springs (now within the present Lassen Volcanic National Park),

"all taking to horse, we wind through the forest of *Picea amabilis,*[1] or red silver fir, eight miles, and (Corydalis) Caseana valley is reached. This is a meadow or swamp of rank herbs and grasses skirted with alders and cut through a stream the banks of which are lined with the new *Corydalis Caseana,* which I have omitted to describe until we came to its home. Here the plant grows to the largest size and presents the finest appearance of any locality yet found. It is often four or five feet high, and its fragrance is detected 10 rods away. The abundant foliage is pea green, and the robust branches terminate in spikes of white flowers holding a purple swollen palatee [referring to the petal tips—W.A.D.] in the open mouth, and provided with a large spur or sac of nectar below. The succeeding pods contain four to six black, ariled, hard seeds, that when ripe are thrown to a great distance by the valves of the pods. The slightest breath or touch, and woe to the curious eyes unprotected. With difficulty I have captured a few seeds, as you would catch grasshoppers, and sent them abroad. Thriving plants are now reported in Cambridge, Philadelphia and Washington, also in England and the continent."

The last two years of Case's life ended in tragedy. His associates noted that he was conspicuously failing mentally. On Wednesday afternoon, November 18, 1925, he shot himself through the heart on the grave of his wife. He left a daughter and two grandchildren. He was Treasurer of the Sierra County Chapter of the American Red Cross, a Mason, Knight Templar, and Odd Fellow and was given a Masonic funeral. His finances proved to be in deplorable state; there was a shortage of nearly $25,000

[1] Presumably the California red fir (*Abies magnifica* Murr.) is intended. The following trees are not known to occur in California: Pacific silver fir [*Abies amabilis* (Dougl.) Forbes, syn. *Picea amabilis* Dougl. ex Loud.]; subalpine fir [*A. lasiocarpa* (Hook.) Nutt., syn. *Picea amabilis* Gordon in part]; noble fir [*A. procera* Rehd., syns. *A. nobilis* (Dougl.) Lindl., *Picea amabilis* Hort. ex Carr.].—W.A.D.

in county funds, and he owed numerous individuals about an equal amount. Case was a very frugal man, lived modestly and the Downieville Mountain Messenger of December 5, 1925, observed: "Where this money . . . has disappeared without leaving any traces . . . is one of the queerest features in a decidedly queer case." Downieville was stunned by the situation, the "Messenger," remarking: "Mr. Case was known to nearly every resident of Sierra County, all of whom esteemed him highly." Beside Case's body, when it was discovered, were two letters, one addressed to his daughter and the other jointly to Henry E. Quigley (County Clerk and Auditor) and District Attorney Henry B. Neville. The latter read as follows: "Being a bankrupt, defaulter and a 'liar' I can not live longer! No blame in my heart toward you. You have simply done your duty. . . . No hope. I deserve nothing but censure. Business matters simply awful! Phone to Mamie and Fred [his daughter and son-in-law] not to come up to attend funeral. . . . Of course I don't deserve—and I don't want—a Masonic funeral. Glad I'm not entitled to it."

A Mr. Frank P. Roddy recalled that the night before he shot himself Case had talked to him about the gruesome John Deerwater murder many years before in Sierra Valley and that the noon of the day of Case's death his talk had been incoherent. A former convict, who later evaded the authorities, ran a chicken farm on Case's property and whether this had any possible connection with Case's difficulties apparently will never be known.

PLANT RECORDS FROM SAN BENITO COUNTY, CALIFORNIA

BY PETER H. RAVEN

Several recent trips to San Benito County have provided an opportunity to obtain certain collections of plants which, according to the available literature, seem to represent notable extensions of range. Because some of these have considerable phytogeographic interest, they are reported on at this time. Numbers for collections cited are my field numbers, unless otherwise indicated; and the specimens are deposited in the herbarium of the California Academy of Sciences or in the herbarium of the University of California at Berkeley (UC).

MUHLENBERGIA ANDINA (Nutt.) Hitchc. With *Parnassia californica* (Gray) Greene along a stream in a small grove of *Caloced-*

rus decurrens (Torr.) Florin (*Libocedrus decurrens* Torr.; see Taxon 5: 192,—1956), in heavily serpentinized soil, 24.1 miles from junction north of Bitterwater on road to New Idria *(8827).* I can find no previous record from cismontane California for this grass, which is generally thought of as Sierran in this State.

MUHLENBERGIA ASPERIFOLIA (Nees & Mey.) Parodi. Along Clear Creek near road to New Idria, 18.8 miles from junction north of Bitterwater *(8825).* Here it grew in serpentine soil, and was associated with such other typical Great Basin plants as *Haplopappus racemosus* (Nutt.) Torr. *(8818)* and *Chrysothamnus naueosus* (Pall.) Britt. ssp. *mohavensis* (Greene) Hall & Clements *(8819),* as well as other, more local plants such as *Salix Breweri* Bebb *(8822), Solidago confinis* Gray, and *Aquilegia eximia* Van Houtte ex Planch. *(8826).* The last was in full bloom on September 1, 1955, and heavily browsed by deer.

The *Muhlenbergia* was not reported from the Coast Ranges or central San Joaquin Valley by Beetle (Hilgardia 17:334, —1947), but the following specimens indicate a somewhat more extensive distribution: Corral Hollow, San Joaquin Co., *Howell 10847, E. Crum 1486* (UC); Cuyama Ranch, 2200 feet elevation, San Luis Obispo Co., *W. A. Peterson 342* (UC); 1 mile south of Merced, Merced Co., *Mrs. F. Angwin in 1934* (UC); Lockwood Valley, Ventura Co., *Pollard in 1949;* Willits Hot Springs, Sespe Creek, Ventura Co.,. *Dudley & Lamb 4795* (UC).

ALLIUM BURLEWII Davidson. Near Bench-mark X3046 along Clear Creek about 7 miles from Hernandez, with *Pinus Sabiniana, P. Jeffreyi, Quercus durata, Arctostaphylos glauca,* and *Eriodictyon californicum (9195A,* with G. L. Stebbins, Jr., R. Tomich, *et al.*); Vallecito region, either on Griswold Hills or at New Idria Mine, *G. Lyon 774* (UC; det. M. Ownbey). Not reported from north of the San Emigdio Range.

PHORADENDRON JUNIPERINUM Engelm. var. LIBOCEDRI Engelm. Common on a single tree of *Calocedrus decurrens,* on the southeast slope of San Benito Peak, at about 4900 feet elevation *(9201,* with Stebbins and Tomich). This seems to be the first record from the central Coast Ranges.

LANGLOISIA SCHOTTII (Torr.) Greene. Although H. L. Mason (in Abrams, Illustr. Fl. Pac. States 3:453, —1951) does not cite this species from north of the Mojave Desert in California, Jepson (Fl. Calif. 3:221, —1943) mentions a collection from the Kettleman Hills, Kings County, and the following may also be cited: deserty slope near junction of Griswold Hills with road to New

Idria, with *Yucca Whipplei* and *Ephedra californica (9237,* with Stebbins and Tomich; *Mason 12574,* UC; *G. Lyon 949,* UC). I have also seen collections from the inner south Coast Ranges in Fresno, Kern, and San Luis Obispo counties.

PHACELIA RATTANII Gray. In oak woodland near the mouth of Horsethief Canyon, 3.6 miles south of Hernandez on road to Coalinga *(9162,* with Stebbins and Tomich); between Templeton and Cayucos, San Luis Obispo Co., *Eastwood & Howell 2281;* Jack Creek bridge in Dover Canyon, Santa Lucia Mts., San Luis Obispo Co., *Ferris 9782* (CAS, UC). South to the Santa Cruz Mountains and Mount Hamilton Range, according to Jepson (Fl. Calif. 3:267, —1943).

NICOTIANA ATTENUATA Torr. Cole Gem Mine, on a shoulder of Santa Rita Peak at about 4500 feet elevation, San Carlos Range *(8834).* According to Jepson (Fl. Calif. 3:453, —1943), "basically a Great Basin plant, . . . in California almost wholly transmontane. . . ." Seemingly the first report from between Humboldt and Trinity counties on the north and the San Emigdio Range on the south (see Goodspeed, The Genus Nicotiana, p. 429, —1954).

NEW RECORDS OF WESTERN PLANTS

BY JOSEPH MONACHINO
The New York Botanical Garden, New York

The following plants were collected by the writer in Montana and Washington during 1953 and 1954 and vouchers are deposited in the Herbarium of The New York Botanical Garden. They appear to be first records for the respective states. With the exception of the *Gaultheria,* all are European weeds which surely will in time greatly increase their range in the United States. The *Lychnis, Ajuga,* and *Hieracium* are already naturalized in the East.

LYCHNIS DIOICA L. Longmire, Mount Rainier National Park, Pierce Co., Wash., July 16, 1954. The species had already been collected in 1933 at Coeur d'Alene, Idaho (*J. H. Christ 2404,* det. C. V. Morton).

AJUGA REPTANS L. Longmire, Mount Rainier National Park, July 16, 1954. Large dense colony, spreading by stolons; flowers blue.

PARENTUCELLIA VISCOSA (L.) Car. Lowland approach to Mt.

Rainier, Pierce Co., Wash., July 12, 1954; abundant in a field. The species also has been collected in Snohomish Co., Wash. (*J. G. Witt 1976,* Aug. 2, 1954). It is known from Oregon and California.

HIERACIUM AURANTIACUM L. Bremerton, Illahee State Park, Kitsap Co., Wash., July 17, 1954; a considerable stand in a lawn. The mention of this species on page 235 in part 5 of Vascular Plants of the Pacific Northwest (Hitchcock *et al.,* 1955) is based on the present collection.

FILAGO ARVENSIS L. Glacier National Park, near Belton, Flathead Co., Mont., July 21, 1953; not rare. The species also has been collected in British Columbia, Idaho (several times), and Michigan.

GAULTHERIA OVATIFOLIA Gray. Glacier National Park, near Belton, Mont., July 20, 1953; occasional. This northwestern species is known from northern Idaho; the present report is a slight eastern extension of range.

NOTES ON TWO UMBELLIFEROUS WEEDS IN CALIFORNIA. Since the recent discussion by J. T. Howell on the status of *Apium leptophyllum* (Pers.) F. Muell. in California (Leafl. West. Bot. 6:219–220, —1952), it has been reported as a weed in Santa Barbara by C. F. Smith (A Flora of Santa Barbara, p. 56, —1952), and collected there twice by Henry M. Pollard *(Pollard in 1950, in 1952).* The following weedy occurrences have also come to our attention: common lawn and roadside weed, Lompoc, Santa Barbara Co., *Pollard in 1952;* roadside, Ventura, Ventura Co., *Pollard in 1949;* lawn weed, Alameda, Alameda Co., *F. Payne in 1952;* lawn and garden weed, Westwood, Los Angeles, Los Angeles Co., *Raven 9398, 9401.*

I also collected *Hydrocotyle sibthorpioides* Lam. in weedy lawns in Westwood (my *No. 9402)* and noted it as locally common in several places. I have also seen a specimen from a lawn in San Mateo, San Mateo Co. *(W. J. Bevan in 1951).* I can find no previous record from the western United States, but this variable, nearly pantropical weed may well become established to a limited extent in California. It can easily be distinguished from other North American species by the characters given by Mathias and Constance in the North American Flora (Vol. 28B:52, —1944).—PETER H. RAVEN.

THE IDENTITY OF CAREX ALBIDA BAILEY

BY JOHN THOMAS HOWELL

It would appear that neither Mackenzie nor Stacey appreciated the problems of Californian phytogeography when each of them referred *Carex albida* Bailey to synonymy under *C. Lemmonii* W. Boott. Although *C. Lemmonii* was recognized as a montane species with chiefly a Sierran distribution by both these workers, each of them identified as *C. Lemmonii* the type collection of *C. albida* which came from a distantly removed part of the central California Coast Ranges at an elevation of less than a thousand feet. Unfortunately Stacey persisted in this error even after making field studies in the region where the type of *C. albida* was collected—he continued to call the type plant of that species *C. Lemmonii,* while the plants he saw growing he described as new. I am convinced that *C. sonomensis* Stacey is a synonym of *C. albida* Bailey. The type of *C. albida* was collected by Bigelow on Santa Rosa Creek in 1854 and the type of *C. sonomensis* was collected by Howell and Stacey at the Pitkin Marsh in the same general region in 1937.

An examination of the type collection of *C. albida* preserved in the Torrey Herbarium at the New York Botanical Garden explains why Mackenzie and Stacey misinterpreted the plant. This specimen, which has been annotated by Bailey, Mackenzie, and Stacey, consists of two immature pieces, but since the piece on the right is the larger and more mature it is the one on which studies, past and present, have been made. This part of the specimen carries six spikelets, of which the two uppermost are so closely approximate that they appear to be one, and, since there is an open interval between them and the next lateral spikelet below, the pair appears to be pedunculate. Because *C. Lemmonii* has been differentiated from its relatives by "uppermost pistillate spikes strongly overtopped by the staminate spike. . ." (Mackenzie, 1931–1935, p. 311), *C. albida* seemed to agree with *C. Lemmonii.* However, since the type material of *C. albida* is young, I believe that if it had matured its two uppermost spikelets would have exhibited the contrasting character: "uppermost pistillate spikes little exceeded by the staminate spike" (Mackenzie, l. c.), one of the characters used by Stacey (1937, p. 64) to separate *C. sonomensis* and *C. luzulina* from *C. Lemmonii.*

Another character for distinguishing *C. albida* from *C. Lem-*

monii which I discovered while critically examining these plants is to be found on the teeth of the perigynium-beak. Whereas these tiny points are smooth in *C. Lemmonii,* in *C. albida* they are frequently minutely serrulate-hispidulous-roughened, both inside and out. This character, as well as the characters of the perigynia, inflorescence, and leaves, indicates that *C. albida* is more closely related to *C. luzulina* than to *C. Lemmonii.* Although Mackenzie in the N. Amer. Fl. (p. 314) states that *C. albida* "apparently is best placed under *C. Lemmonii*", before that he too had realized the interrelationship of *C. albida* and *C. luzulina* and had referred it in synonymy to that species (see below under *C. luzulina*). The brownish-purple-tinged perigynia and the brownish scales of *C. luzulina* differentiate it from *C. albida* in which the perigynia are pale and the scales are whitish-hyaline except for the pale midrib.

When Bailey described *C. albida* (1889, p. 9), he referred to specimens collected on Santa Rosa Creek, California, by Thurber and by Bigelow to be found in herb. Boott. and herb. Torrey., and specimens by these two collectors are cited by Kükenthal (1909, p. 558). I do not believe that Thurber ever collected this plant and that his name was used inadvertently by Boott when he was examining material of Bigelow's collection submitted to him. In Boott's notation, as given on the sheet in the New York Botanical Garden, his reference to "Thurber's specimens" has been altered by someone, possibly Torrey, to "Bigelow's? specimens." Boott's note was later published in Pacific Railroad Survey Botany (p. 154) under *C. cherokeensis* and there it is Bigelow, not Thurber, who is named.

To ascertain the nature of the collection in herb. Boott., I sought information about it from Mr. E. Nelmes, specialist in *Cyperaceae* at Kew, and he kindly sent me a detailed description of plants, labels, and annotations on the sheet there. In herb. Kew. there are four culms, two in herb. Boott. and two in herb. Hooker., all mounted on the same sheet. The specimen in herb. Hooker. is accompanied by the same printed label that is found on the specimen in New York, while the one in herb. Boott. carries two labels, one with "Thurber . . . Gray sent 1854" in Boott's hand and the other with "No. 20. Thurber" in Boott's hand. It would appear that all of the specimens are from a single collection made by Bigelow and that either Gray or Boott attributed to Thurber by mistake the specimen sent to Boott for determination.

The following is a nomenclatural and bibliographic synopsis of *C. albida* with the citation of material I have examined:

CAREX ALBIDA Bailey, Mem. Torr. Bot. Club 1: 9 (1889). *C. luzulaefolia* W. Boott var. *ablata* (Bailey) Kükenthal forma *albida* (Bailey) Kükenthal in Engler, Das Pflanzenreich IV. 20 (Heft 38): 558 (1909).

C. cherokeensis Boott in Torrey, Pacific RR. Reports (Botany) 4: 154 (1857), and W. Boott in S. Watson Bot. Calif. 2: 248 (1880); not Schweinitz.

C. luzulina Mackenzie in part, Erythea 8: 64 (1922); in Jepson Fl. Calif. 1: 231 (1922); in Abrams Ill. Fl. Pacific States 1: 325 (1923); not Olney.

C. Lemmonii Mackenzie in part, N. Amer. Fl. 18: 314 (1935); not W. Boott.

C. sonomensis Stacey, Leafl. West. Bot. 2: 63 (1937); M. S. Baker in A Partial List of Seed Plants of the North Coast Ranges of California, p. 7 (June, 1951), mimeographed; P. Rubtzoff, Wasmann Journ. Biol. 11: 160 (1953).

COLLECTIONS (all from Sonoma County, California): Santa Rosa Creek, *Bigelow in 1854* (May 1, acc. Pacific RR. Rept. 4: 154), type collection of *C. albida* (Torrey Herbarium in NY); Pitkin Marsh *Howell & Stacey 12681, Howell & Stacey 13042* (type, CAS), *Howell 20889, Howell 32621, M. S. Baker 11392, Rubtzoff 140, 235, 256, 496;* Perry's Ranch near Sebastopol, *Hoover 4111.*

CALIFORNIA RECORDS OF KOELERIA PHLEOIDES. New information on the expanding distribution of *Koeleria phleoides* (Vill.) Pers. in California has not been printed to my knowledge since Hitchcock listed three collections in Jepson, Fl. Calif. 1: 131 (1912). These collections came from Shasta, Butte, and San Joaquin counties. The following collections in the California Academy of Sciences indicate a present wider dispersal: flood bed of Dibble Creek just north of Red Bluff, Tehama Co., *Howell 29187* in 1954; common in rocky grassland, McLaren Park, San Francisco, San Francisco Co., *Raven 9251* in 1956; Bayview Hills, San Francisco, *Howell 31628* in 1956; street weed, Alameda, Alameda Co., *Howell 31248* in 1956; Los Banos bird reserve, Merced Co., *Eastwood 17961* in 1930; Millerton, Fresno Co., *Eastwood & Howell 5441* in 1938; Gillis Canyon southeast of Shandon, San Luis Obispo Co., *Howell 24376* in 1948; grassy valley, 7 miles north of Woodlake, Tulare Co., *Howell & Barneby 29236* in 1954; dry grassy hills, 7 miles east of Famoso, Kern Co., *Howell & Barneby 29199* in 1954; Ross Canyon, 8 miles south of Blackwell's Corner, Kern Co., *Twisselmann 1053* in 1954; Antelope Plains, 9 miles southwest of Blackwell's Corner, Kern Co., *Twisselmann 1858* in 1955. All of these collections except the one from Alameda have pilose spikelets.

—J. T. HOWELL.

Vol. VIII No. 8

LEAFLETS
of
WESTERN BOTANY

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JOHN THOMAS HOWELL

THE 1932 TEMPLETON CROCKER EXPEDITION, TWENTY-FIVE YEARS AFTER

BY JOHN THOMAS HOWELL

The year 1957, besides marking the twenty-fifth anniversary of LEAFLETS OF WESTERN BOTANY, is also the twenty-fifth anniversary of the 1932 Templeton Crocker Expedition of the California Academy of Sciences. Although a few *Festschrift* pages here are scarcely commensurate with the overall scientific accomplishments of that expedition, I believe that this is the appropriate time to recall the importance of the expedition to the Academy, to place on record the total number of plant collections, and to present an up-to-date bibliography pertaining to the plants and to the botanical activities. At this time it seems proper to publish a letter written by the late Templeton Crocker* in which he writes of his happy recollection of the first large-scale scientific expedition he directed. And I am grateful to my friend C. V. Morton for his important contribution to the celebration.

G Dallas Hanna has already given a brief account of the expedition (Science, New Series, 76:375–377, —1932) and C. E. Grunsky and Templeton Crocker give a list of personnel and an itinerary with map in the papers which open the two volumes of the Academy's Proceedings that are devoted almost in their entirety to the reports on the natural history collections of the expedition (Proc. Calif. Acad. Sci., Ser. 4, vols. 21, 22). Suffice it to repeat here, the expedition under the direction of Mr. Crocker sailed from Yacht Harbor, San Francisco, on his yacht *Zaca* on March 10, 1932, and docked at Pier 45 at the end of the return trip on September 1, 1932. During this time, 9046 miles were traversed and landings were made on the shores of the Galápagos Islands, Costa Rica, Nicaragua, Mexico, and southern California.

Besides the extensive natural history collections obtained, the expedition made important contributions to the geography and hydrography of places visited, particularly in the Galápagos Islands. One of the outstanding geographic accomplishments was the first ascent of the highest central point of Indefatigable Island which now bears the name Mt. Crocker. Already I have

* Mr. Crocker died in San Francisco, Dec. 12, 1948.

Leaflets of Western Botany, Vol. VIII, pp. 181–200, December 6, 1957.

published an account of this ascent (Sierra Club Bulletin 27:79–82, —1942), but the pictures published here are the first to show the fern-covered summit. It seems particularly appropriate that the unnamed caulescent fern, which is the most conspicuous vegetative feature of the highest slopes of the mountain, is being named and described at this time.

Although the high attainment of the expedition is primarily a tribute to Mr. Crocker, whose generosity paid for it and whose personal direction of activities netted such rich scientific returns, the importance of the expedition is also a tribute to Barton Warren Evermann who envisioned the whole. The 1932 expedition is to be counted as the final crowning achievement in Dr. Evermann's distinguished career which was closed by his death less than a month after the return of the expedition.

In botany the collecting of vascular plants was first in order of attention, but as botanist on the expedition I also made a special effort to collect algae and liverworts. Whenever I dedected liverworts, I collected them for my friend, Mrs. Dorothy Sutliffe; and algae I collected for my good friend and inspiring teacher, William Albert Setchell, who touched my pride when he asked me to get what algae I could, but added "of course I know phanerogamic botanists don't like to get their feet wet." Fungi, lichens, and mosses, I regret to state, did not receive the attention they deserved; but if I had given them more attention, some other branch of collecting would have had to be neglected.

The following table lists the approximate total number of specimens (not counting duplicates) obtained in the major plant groups. The figure for the vascular plants is derived from my field numbers. I did not give field numbers to non-vascular cryptogams, so the totals for them are generally based on the numbers assigned to collections by specialists who studied them.

NUMBER OF BOTANICAL COLLECTIONS

Algae	1000
Fungi	75
Lichens	50
Hepaticae	140
Musci	50
Vascular Plants	2555
Total	3870

NUMBER OF NOVELTIES DESCRIBED FROM THE BOTANICAL COLLECTIONS

	Genus	*Species*	*Subspecies, varieties, and forms*
Algae	..	42	8
Fungi	..	3	..
Lichens	..	3	..
Hepaticae	..	9	..
Musci	..	2	..
Vascular Plants	1	32	28
Totals	1	91	36

BIBLIOGRAPHY RELATING TO THE BOTANY OF THE TEMPLETON CROCKER EXPEDITION OF THE CALIFORNIA ACADEMY OF SCIENCES, 1932 COMPILED FOR THE YEARS 1932 TO 1957

1. GENERAL ACCOUNTS OF THE EXPEDITION

CROCKER, TEMPLETON.

1933. Introductory statement. Proc. Calif. Acad. Sci., Ser. 4, 21:3–12, Plate 1 (Map).

GRUNSKY, CARL EWALD.

1933. Foreword. Proc. Calif. Acad. Sci., Ser. 4, 21:1, 2.

HANNA, G DALLAS.

1932. The Templeton Crocker Expedition of the California Academy of Sciences. Science, New Series, 76:375–377.

ROTCH, GARLAND.

1933. Appendix B. Itinerary of the Templeton Crocker Expedition of the California Academy of Sciences, 1932, pp. 8, 9. *In:* Introductory statement, by Templeton Crocker. Proc. Calif. Acad. Sci., Ser. 4, 21:3–12.

2. BOTANICAL CONTRIBUTIONS

BARTRAM, EDWIN B.

1933. Mosses of the Templeton Crocker Expedition. Proc. Calif. Acad. Sci., Ser. 4, 21:75–86.

BONAR, LEE.

1939. Fungi from the Galapagos and other Pacific coastal islands. Proc. Calif. Acad. Sci., Ser. 4, 22:195–206.

CLARK, LOIS.
1953. Some Hepaticae from the Galapagos, Cocos, and other Pacific coast islands. Proc. Calif. Acad. Sci., Ser. 4, 27:593–624.

DARBISHIRE, OTTO VERNON.
1935. The Roccellaceae. Proc. Calif. Acad. Sci., Ser 4, 21:285–294.

HITCHCOCK, ALBERT SPEAR.
1935. New species of grasses from the Galapagos and the Revillagigedo islands. Proc. Calif. Acad. Sci., Ser. 4, 21:295–300.

HOWE, MARSHALL A.
1934. The Hepaticae (chiefly Riccia and Anthocerotaceae) of the Galapagos Islands and the coast and islands of Central America and Mexico. Proc. Calif. Acad. Sci., Ser. 4, 21:199–210.

HOWELL, JOHN THOMAS.
1933. The genus Mollugo in the Galapagos Islands. Proc. Calif. Acad. Sci., Ser. 4, 21:13–23.

The Cactaceae of the Galapagos Islands. Proc. Calif. Acad. Sci., Ser. 4, 21:41–54.

[Euphorbia guadalupensis J. T. Howell, spec. nov., pp. 51, 52.] *In:* Some western euphorbias of the section Anisophyllum. Leafl. West. Bot. 1:51–54.

The Amaranthaceae of the Galapagos Islands. Proc. Calif. Acad. Sci., Ser. 4, 21:87–116.

1934. Cacti in the Galapagos Islands. Cactus and Succulent Journal 5:515–518, 531, 532.

Concerning the names of the species of Cereus in the Galapagos Islands. Cactus and Succulent Journal 5:585, 586.

1935. The vascular plants from San Nicolas Island, California. Proc. Calif. Acad. Sci., Ser. 4, 21:277–284.

New flowering plants from the Galapagos Islands. Proc. Calif. Acad. Sci., Ser. 4, 21:329–336.

1937. The plant genus Coldenia in the Galapagos Islands. Proc. Calif. Acad. Sci., Ser. 4, 22:99–110.

1941. My visits to Guadalupe Island. Leafl. West. Bot. 3:36–41.

The genus Scalesia. Proc. Calif. Acad. Sci., Ser. 4, 22: 221–271.

1942. A list of vascular plants from Guadalupe Island, Lower California. Leafl. West. Bot. 3:145–155.

Up under the Equator. Sierra Club Bulletin 27:79–82.

A short list of plants from Cedros Island, Lower California. Leafl. West. Bot. 3:180–185.

1949. Eight days in the Revillagigedo Islands. Leafl. West. Bot. 5:157–162.

1952. [Sida salviaefolia Presl var. submutica J. T. Howell, var. nov., p. 169.] *In:* Notes on Malvaceae II, by Thomas H. Kearney. Leafl. West. Bot. 6:165–172.

1957. The 1932 Templeton Crocker Expedition, twenty-five years after. Leafl. West. Bot. 8:181–186.

The Atriplex of the Galapagos Islands. Leafl. West. Bot. 8:195–197.

KEARNEY, THOMAS H.

1952. [Malvastrum insulare Kearney, spec. nov., pp. 167, 168.] *In:* Notes on Malvaceae II. Leafl. West. Bot. 6:165–172.

KILLIP, ELLSWORTH P.

1938. [Passiflora foetida var. galapagensis Killip, var. nov., p. 505.] *In:* American species of Passifloraceae. Field Mus. Nat. Hist., Bot. Ser., Vol. 19, parts I and II, pp. 1–613.

LEGRAND, C. DIEGO.

1953. [Portulaca lutea Soland. Howellii, nov. var., pp. 11, 12, Plate VI.] *In:* Notas sobre Portulaca. Comunicaciones Botanicas del Museo de Historia Natural de Montevideo, Vol. 2, No. 27, pp. 1–21.

LINDER, DAVID H.

1934. Lichens. Proc. Calif. Acad. Sci., Ser. 4, 21:211–224.

MORTON, C. V.

1957. Ferns of the Galapagos Islands. Leafl. West. Bot. 8:188–195.

O'NEILL, HUGH, AND BROTHER BENEDICT AYRES, F. S. C.

1944. [Cyperus Howellii O'Neill & Benedict, spec. nov., p. 35.] *In:* Some New World Cyperi. Leafl. West. Bot. 4:33–38.

SETCHELL, WILLIAM ALBERT.

1937. Report on the sargassums. Proc. Calif. Acad. Sci., Ser. 4, 22:127–158.

SETCHELL, WILLIAM ALBERT, AND NATHANIEL LYON GARDNER.

1937. A preliminary report on the algae. Proc. Calif. Acad. Sci., Ser. 4, 22:65–98.

SLEUMER, HERMANN.

1935. [P(ernettya) Howellii sp. nov., p. 649.] *In:* Revision der Gattung Pernettya Gaud. Notizbl. Bot. Gart. u. Mus. Berlin-Dahlem 12:626–655.

STANDLEY, PAUL C.

1944. [Bursera Howellii Standl., sp. nov., pp. 58, 59. Randia crescentioides Standl., sp. nov., pp. 88, 89.] *In:* Studies of Central American Plants —IV, by Paul C. Standley and Julian A. Steyermark. Field Mus. Nat. Hist., Bot. Ser., 23:31–109.

[Disciphania nesiotes Standl., sp. nov., pp. 113, 114.] *In:* Studies of Central American Plants —V, by Paul C. Standley and Julian A. Steyermark. Field Mus. Nat. Hist., Bot. Ser., 23:113–150.

SVENSON, HENRY K.

1939. The Cyperaceae. Proc. Calif. Acad. Sci., Ser. 4, 22:187–193.

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All pictures except Pate 1 are from photographs by Toshio Asaeda, expedition photographer and artist.

Plate 1. On board the *Zaca*, sailing day, March 10, 1932 (left to right): J. T. Howell, Templeton Crocker, Captain Garland Rotch, and Robert J. Lanier. (San Francisco Examiner photograph.)

Plate 2a. Indefatigable Island from Academy Bay with the *Zaca* at anchor. Mt. Crocker is the highest point on the skyline.

Plate 2b. The fog-shrouded summit of Mt. Crocker, elevation about 2300 feet. The floor and walls of the much-wasted crater are covered with a low dense growth of plants, the tallest and most conspicuous being the tree-fern, *Hemitelia Weatherbyana* Morton.

945 GREEN STREET
SAN FRANCISCO

September 7, 1942.

My dear Howell:

I was very much impressed by the expressions in your letter commemorating the tenth anniversary of our expedition. It came as a surprise, because so much has intervened that I would have thought it closer to twelve or fourteen years since we entered the Golden Gate so very early in the morning on September first, 1932.

That was my first experience, but the crew and I profited so much that we were able to carry on through five subsequent expeditions.

The Zaca and ourselves have travelled 66,915 miles in our devotion to science, and two additional trips had been planned when finances, then the war, made us stop.

I can say without reservation that the Galapagos venture was the most successful from the standpoint of successful accomplishment. On none of my expeditions has everyone cooperated so willingly and effectively with those whose sole interest was to assist you all. The most expert and the most energetic workers were yourself and Coultas, field ornithologist of the American Museum of Natural History.

In 1932 I had not the experience to appreciate fully your persistency and enthusiasm, but I can now.

Your description of the Indefatigable climb was most interesting to me. Do you remember that night at Horniman's when you tried to spend the night in a baby's crib?

I congratulate you on the work you have so far accomplished on your collection of Galapagos material, and hope that the time spent on it will bring up memories that will always be as pleasant as they are to me.

With kindest regards,

Templeton Crocker.

Crocker's reply to greetings on the tenth anniversary of his 1932 expedition to the Galapagos Islands.

FERNS OF THE GALAPAGOS ISLANDS[1]

BY C. V. MORTON
U. S. National Museum, Washington, D.C.

The ferns of the Galápagos Islands have been listed several times, by Hooker, Robinson, Stewart, and others. The most recent and complete list is "Pteridophyta of the Galápagos and Cocos Islands," by H. K. Svenson[2], which summarizes the work of previous investigators. Altogether 68 species are listed definitely from the Galápagos. The collections made by Mr. John Thomas Howell while a member of the Templeton Crocker Expedition in 1932 added three species to the known fern flora.

Studies undertaken incidental to identifying some of Mr. Howell's collections have revealed that several species of Svenson's list were incorrectly determined. The present paper gives some of the results of this work. However, no attempt has been made to study many of the species that have been listed. Future studies may well result in some additional nomenclatural or taxonomic changes.

Ophioglossaceae

OPHIOGLOSSUM RETICULATUM L. Albemarle Island: Villamil Mountain, above Santo Tomás, *Howell 9001.*

This species is not included in Svenson's list. It was reported by Clausen.[3]

Cyatheaceae

Hemitelia Weatherbyana Morton, spec. nov. Arbor, trunco erecto, usque ad 3 m. alto apice paleato, paleis lineari-lanceolatis, 2–2.5 cm. longis, 4–5 mm. basi latis, apice filiformibus, valde bicoloribus, medio fuscis, marginibus pallidis apicem versus erosis; stipites castanei, apicem versus circa 7 mm. diametro, furfuracei, remote tuberculati sed vix spinosi; rhachis straminea, inermis, parcissime furfuracea, supra canaliculata; lamina bipinnato-pinnatifida, pinnis alternis breviter petiolulatis (6–15 mm.), oblongo-lanceolatis, maximis 44 cm. longis et 20.5 cm. latis, longe acuminatis, rhachilla brunnea, furfuracea, supra canaliculata, pinnulis 15–20-jugis, alternis, sessilibus, maximis circa 11 cm. longis et 2 cm. latis, acuminatis, segmentis circa 18-jugis infra apicem pinnatifidum, oblongis, circa 1 cm. longis et 5 mm. latis, paulo falcatis, apice vix acutis, apicem versus subdenticulatis vel maximis ubique crenulatis, basi in alam 1.5–2.5 mm. latam conjunctis, supra in costulis brunneo-pilosulis alibi glabris, subtus in costis paleis substramineis subplanis longe ciliatis usque ad 5 mm. longis ornatis, in costis venis superficiebusque pilosulis, pilis patulis hyalinis multicellularibus, in costis et venis paleatis,

[1] Published by permission of the Secretary of the Smithsonian Institution.
[2] Bull. Torrey Bot. Club 65: 303–333 (1938).
[3] Clausen, Robert T. A monograph of the Ophioglossaceae. Mem. Torrey Bot. Club 19: 133 (1938).

paleis albidis vel subhyalinis subcucullatis longe acuminatis; venae liberae, 7–9-jugae, omnes furcatae, subtus prominentes; sori magni, supramediales, dorso in ramulo antico venarum vel deorsum in ramulis ambobus positi; indusium semi-hemisphaericum, antice apertum, hyalinum vel subbrunneum, glabrum, apice subdentatum vel erosum; receptaculum magnum sphaericum prominens; paraphyses nullae vel non obviae.

Type in the United States National Herbarium, No. 2,204,812, collected on Mount Crocker, Indefatigable Island, Galápagos Islands, May 9, 1932, by John Thomas Howell *(No. 9227)*. Isotype in the California Academy of Sciences. Additional specimens: ALBEMARLE ISLAND: Villamil, common on the south, east, and southeast inner walls of crater-at 3150 feet elevation and occasionally on the outside above 2450 feet, Aug. 28, 1905, *A. Stewart 894* (CAS, US). JAMES ISLAND: James Bay, trees 8–10 feet high on south and southeast sides above 2750 feet elevation, Aug. 8, 1905, *A. Stewart 896* (CAS, US), *897* (CAS, US). CHATHAM ISLAND: Wreck Bay, trees 6–10 feet high, common on the south and southeast sides of the main mountain at 1800–2000 feet elevation, Feb. 23, 1906, *A. Stewart 895* (CAS, US).

This, the only tree-fern of the Galápagos, is the dominant plant of the higher elevations of the interior mountains, where it is one of the few woody or tree-like plants. A description of the peculiar habitat where the type was found (in the crater of Mount Crocker) will be found in Mr. Howell's paper "Up under the Equator."[4]

A. Stewart identified and reported his collections as *H. multiflora,* but, as pointed out by Svenson *(op. cit.* 318), they are quite different from that species as delimited by Maxon.[5] Svenson listed this plant as *Hemitelia aff. subcaesia* Sodiro, but such a relationship is extremely unlikely. As shown by Sodiro's original description[6] ("involucro cupuliformi") and by a specimen in the United States National Herbarium collected by Sodiro "in sylvis subandinis montis Cotacachi" in April, 1874, which is probably a part of a syntype, *"Hemitelia" subcaesia* is not a *Hemitelia* at all but a true *Cyathea.* I would not exactly describe its indusium as "cupuliform"; it is rather "patelliform," a circular disk completely surrounding the receptacle at base. The present species, *H. Weatherbyana,* is a true and typical *Hemitelia,* with a one-sided, half-spherical indusium facing outward. The deter-

[4] Sierra Club Bulletin 27: 79–82 (1942).
[5] Maxon, W. R. On the identity of Hemitelia multiflora, the type of the genus Hemitelia. Bull. Torrey Bot. Club 38: 545–550 (1912).
[6] Sodiro, Luis. Crypt. Vasc. Quit. 522 (1893).

mination of its true relationship must await future studies of the South American representatives of the genus. I do not find any species that seem close.

It has been often stated that the character of the indusia is an unreliable guide to relationships in the *Cyatheaceae,* and that consequently the traditional genera *Cyathea, Alsophila,* and *Hemitelia* ought to be merged in *Cyathea.* In my opinion this radical viewpoint, involving the renaming of hundreds of species, has not been proved. It may well be true that a more natural classification could be developed by an intensive comparative study of anatomy, scales, sporangia, and spores, but until such time it does not seem that anything is to be gained by an indiscriminate dumping of all the species into *Cyathea.*

The species is named in honor of the late Mr. C. A. Weatherby, in recognition of his work in studying various collections from the Galápagos Islands.

Polypodiaceae

BLECHNUM FALCIFORME (Liebm.) C. Chr. Indefatigable Island: Mount Crocker, May 10, 1932, *J. T. Howell 9252.* A surprising extension of range, the first record of a species of the subgenus *Lomaria* from the islands. However, although the range has been thought to be only from Mexico to Panama, there is one collection known from Colombia, which will be reported elsewhere.

Ctenitis pleiosora (Hooker f.) Morton, comb. nov. *Polypodium pleiosoros* Hook. f., Trans. Linn. Soc. [London] 20: 166 (1847). *Dryopteris pleiosora* Svenson, Bull. Torrey Bot. Club 65: 316 (1938).

As I have mentioned in other publications, I believe that the traditional large genus *Dryopteris* may conveniently be split up into three major genera *Dryopteris, Thelypteris,* and *Ctenitis,* which are perhaps not closely allied, and possibly a few smaller ones. This viewpoint necessitates the new combination given above for this endemic species of the Galápagos. The other species of *Ctenitis* known from the area should be called *Ctenitis ampla* (Humb. & Bonpl.) Ching.

DIPLAZIUM EXPANSUM Willd. Indefatigable Island: above Fortuna, *Howell 9275.*

Doubtless the same as *Svenson 132* (which I have not seen), reported by Svenson *(op. cit.* 313) as *"aff. subobtusum* Rosenst." It appears that *D. subobtusum* is a doubtful species, known from

inadequate material, which may or may not be closely allied. *Howell 9275* matches closely *Valeur 547,* from the Dominican Republic, identified by Christensen as *D. expansum,* and it may with fair assurance be so identified. These large compound species of *Diplazium* need working out.

DENNSTAEDTIA CICUTARIA (Swartz) Moore. Indefatigable Island: forest belt, Fortuna, *Howell 9192.*

A first record for the Galápagos Islands. Another species of *Dennstaedtia, D. globulifera* (Poiret) Hieron., has been known from James Island *(Stewart 882, 883).* It was reported by Stewart, strangely enough, as *Polystichum apiifolium,* i.e. *Maxonia apiifolia,* which is, of course, an entirely unrelated plant belonging to a different tribe from *Dennstaedtia. Dennstaedtia cicutaria* may be distinguished at a glance from *D. globulifera* by its greater dissection (quadripinnate rather than tripinnate) and its minute saucer-shaped (rather than large, short-tubular) indusia.

ELAPHOGLOSSUM ENGELII (Karsten) Christ. Indefatigable Island: Mount Crocker, May 10, 1932, *Howell 9250.*

Svenson's list contains only one *Elaphoglossum,* viz., *E. petiolatum* (Swartz) Urban, to which are referred the previous records for *E. Langsdorfii, E. muscosum, E. viscosum,* and *"Acrostichum viscosum* var. *glabriusculum."* Four species are now definitely known from the Galápagos, and strangely enough none of the above names seems to be applicable to any of them. Inexplicably, Svenson annotated *Stewart 775* (Calif. Acad. Sci. No. 91,809) as *"E. petiolatum,"* although this sheet contains obviously three species belonging to three sections of the genus, and none of them is *petiolatum* or even in the same section as that species. One of these is the species here reported as *E. longifolium,* one is *E. glossophyllum,* and the third (the left-hand plant) is possibly the present species *E. Engelii,* but it is fragmentary and scarcely to be identified.

It is likely that the Darwin collection referred by Hooker to *Langsdorfii* and by Robinson to *muscosum* is the same as the Howell collection here referred to *E. Engelii,* a species characterized, among the other species of the island, by having the sterile blades densely paleaceous beneath, with large, imbricate ciliate scales similar to those of *muscosum.* As represented from the type locality (Jamaica) and elsewhere, *E. muscosum* has an essentially erect rhizome with clustered fronds; the stipes are

shorter, with large, pale, spreading scales, and the blades are relatively short and broad. The thick rhizome of *E. Engelii* is obviously creeping and the fronds scattered and subdistichous; the stipes are longer, and the scales smaller, darker, and somewhat appressed.

KEY TO THE SPECIES OF ELAPHOGLOSSUM

Blades densely and persistently scaly beneath, the scales large, imbricate, long-ciliate ..... *E. Engelii*

Blades scaleless, or if scaly *(E. leptophyllum)* the scales small, few, and by no means imbricate.

Rhizome thick (6 mm. in diameter or more), short-creeping; rhizome scales large, dark brown, concolorous. Blades large (30 cm. long or more, 4 cm. wide or more) short-stipitate ..... *E. longifolium*

Rhizome slender (2–2.5 mm. in diameter), long-creeping; rhizome scales bicolorous, dark shining black in the center above the middle.

Blades less than 1 cm. wide; stipes slender, 0.4–0.8 mm. in diameter.... ..... *E. leptophyllum*

Blades 3.5–4.5 cm. wide; stipes 1.5 mm. in diameter or more..... ..... *E. glossophyllum*

ELAPHOGLOSSUM GLOSSOPHYLLUM Hieron. Albemarle Island: Villamil, abundant on the sides of steep banks on the south side of the mountain, 3150 feet altitude, *Stewart 775* (Calif. Acad. Sci. 91,809, center plant).

The specimen at hand consists of a part of a rhizome and the stipe and base of a sterile frond. So far as can be determined, it agrees exactly with a syntype of Hieronymus' species *(Lehmann 6944,* from Popayán, Colombia) in the U. S. National Herbarium (No. 1,424,803). The elongate, slender (2 mm. thick) sparingly scaly, creeping rhizome, and the spaced-out, long-stipitate, broad, scaleless fronds readily distinguished this species from the others known from the Galápagos.

ELAPHOGLOSSUM LEPTOPHYLLUM (Fée) Moore. Indefatigable Island: above Fortuna, in the *Miconia*-belt, May 10, 1932, *Howell 9260.*

It is quite likely, on *a priori* grounds, that the Darwin specimen identified by Hooker as *viscosum, i.e.* now *E. petiolatum,* is referable to this species, even though these two species are not at all allied, as noted above.

ELAPHOGLOSSUM LONGIFOLIUM (Jacquin) J. Smith. Albemarle Island: Villamil, 3150 feet, *Stewart 775* p. p. (right-hand plant on Calif. Acad. Sci. No. 91,809).

The specimen at hand consists of a part of a rhizome and parts of two sterile fronds lacking apices. The rhizome is coarse and

thick (over 8 mm. in diameter excluding scales), short-creeping, and densely brown-scaly. The stipes are short and thick, and the blades large, thick, and essentially scaleless. The exact limits of *E. longifolium,* which has been variously interpreted, are uncertain. The type came from Martinique. The original description and comments seem to agree well with *Duss 4121,* from Martinique (U. S. Nat. Herb. 524,035) from which I cannot distinguish the Galápagos plant cited above.

POLYPODIUM ANGUSTIFOLIUM var. AMPHISTEMON (Kunze) Hieron. Indefatigable Island: Mount Crocker, May 9, 1932, *Howell 9232.*

This variety with broad fronds has not previously been reported from the islands. Its real status remains to be determined.

Polypodium bombycinum Maxon[7] var. **insularum** Morton, var. nov. Segmenta comparate pauca, saepe 20–30, inferiora triangularia paucissima (1–3-juga); stipitis paleae saepe bicolores basi nigricantes.

Type in the U. S. National Herbarium, No. 2,204,810, collected in the forest belt at Fortuna, Indefatigable Island, Galápagos Islands, May 8, 1932, by J. T. Howell *(9194).* Other collections are: ALBEMARLE ISLAND: Villamil, common on trunks and branches of trees, 500–600 feet altitude, *Stewart 952* (US). DUNCAN ISLAND: occasional on bushes and small trees at 1200 feet altitude, *Stewart 954* (US). INDEFATIGABLE ISLAND: Academy Bay, on trees, 375–450 feet altitude, *Stewart 956* (US). JAMES ISLAND: James Bay, on trees at 1300 feet altitude, *Stewart 955* (US).

The plant of the Galápagos Islands has usually passed as *Polypodium lepidopteris* (Langsd. & Fisch.) Kunze, but Mr. Weatherby in his paper on this species[8] showed that the true *P. lepidopteris* is restricted to Brazil, Paraguay, and Uruguay, and that the plants of northwestern South America are referable to the related species *P. balaonense* Hieron. and *P. bombycinum* Maxon. In a footnote Mr. Weatherby wrote, "The plant of the Galápagos may prove varietally separable from *P. bombycinum,*" and a note by him, dated 1948, in the U. S. National Herbarium (attached to the specimen *Stewart 952)* reads, "This Galápagos plant I once called *Polypodium bombycinum* var. *oligomeris,* but I have never felt sure enough of my ground to publish the name." I do feel that the Galápagos plant *is* varietally separable, at least, but in the circumstances it scarcely seems justifiable to

[7] Contr. U. S. Nat. Herb. 17: 592 (1916).
[8] Weatherby, C. A. *Polypodium lepidopteris* and its relatives in Brazil. Contr. Gray Herb. 165: 76–82 (1947).

take up the varietal name that Mr. Weatherby suggested but was never willing to publish himself, and consequently I have proposed the new epithet *insularum*.

Typical *P. bombycinum*, when fully mature and well developed, has many pairs of segments (40 or more) and many pairs (5 or more) of reduced triangular lower segments. The scales of the stipe are uniformly bright brown and not bicolorous at base.

Thelypteris columbiana (C. Chr.) Morton, comb. nov. *Dryopteris columbiana* C. Chr. Vid. Selsk. Skr. VII. 4:279 (1907).

This new combination is necessitated by the segregation of *Thelypteris* from *Dryopteris*, as noted above under *Ctenitis*. The other Galápagos species referable to *Thelypteris* are to be known as *T. gongylodes* (Schkuhr) Small, *T. dentata* (Forsk.) E. P. St. John, *T. patens* (Swartz) Small, *T. Poiteana* (Bory) Proctor, and the following:

Thelypteris tetragona (Swartz) Small subsp. **aberrans** Morton, subsp. nov. Rhizoma repens, circa 7 mm. diametro, sparse paleaceum; folia numerosa, subfasciculata; stipes erectus ex basi curvata, quam lamina longior, circa 50 cm. longus, basi circa 3 mm. diametro, profunde sulcatus, stramineus, basi dense paleaceus, paleis anguste lanceolatis, 3–6 mm. longis, 0.5–1 mm. latis, longe attenuatis, integris, pallide, brunneis, externe pilis minutis stellatis sessilibus vestitis, intus glabris, supra basin fere epaleaceus, pilis minutis stellatis stipitatis (2)3–6-radiatis, pallidis subdense instructus; lamina pinnata, ambitu subdeltoidea, usque ad 35 cm. longa et 30 cm. basi lata, rhache pilosa, pilis albidis patentibus circa 1 mm. longis simplicibus et unicellularibus subrigidis, vel apicem versus unifurcatis; pinnae herbaceae, 5-jugae cum impari, subhorizontaliter patentes sessiles lineari-lanceolatae, usque ad 17 cm. longae et 3.2 cm. latae, basi truncata vix angustatae, apice acuminatae, ad costam ⅓–½ pinnatifidae, apice integrae, costa venis superficiebusque subtus villosulis, pilis simplicibus, 0.3–0.5 mm. longis, unicellularibus, subrigidis, patentibus, costa supra antrorse strigosa, costulis supra pilis setiformibus paucis instructis, superficie glabra; segmenta lata, 8–9 mm. longa, basi 5–6 mm. lata, obtusa, paulo falcata integra ciliata; venae 8–11-jugae, 1- vel 2-jugae basales anastomosantes, infirma meniscoidea, secunda ad sinum excurrens, interdum jugae tertiae et aliquando quaternae ad sinum conniventes, venis alteris liberis, margine attingentibus; sori paulo inframediales, parvi; indusium nullum; sporangia setosa, seta rigida unica dorsali decidua; annulus ex circa 14 cellulis induratis compositus.

Type in the U. S. National Herbarium, No. 2,204,811, collected in forest belt at Fortuna, Indefatigable Island, Galápagos Islands, May 8, 1932, by J. T. Howell *(9180)*. Another collection, referable here but not altogether identical, is *Howell 9182* from the same locality. A sterile specimen is *Stewart 885*, from Acad-

Plate 3a. Southeast from the summit of Mt. Crocker. Fog fringes of a persistent cloud cap drift over fern-covered craters.

Plate 3b. "Camp 2" among the ferns in the crater just below the summit of Mt. Crocker.

Plate 4a. "Camp 1" in a clearing in the *Miconia* belt, elevation about 1750 feet. *Miconia Robinsoniana* Cogniaux forms a dense, even, all-pervading thicket on the slopes of Mt. Crocker below the fern belt.

Plate 1b. Forest belt at Fortuna, Indefatigable Island, at the height of the rainy season. Elevation about 750 feet. The trees are *Scalesia pedunculata* var. *Svensoni* Howell; the conspicuous epiphytes are *Tillandsia insularis* Mez.

emy Bay, Indefatigable Island, distributed as *Dryopteris pseudotetragona* Urban and so listed by Stewart.

Typical *T. tetragona* from Jamaica and elsewhere is essentially glabrous beneath on the leaf surfaces between the veins. The numerous short stiff hairs on the lower surfaces are characteristic of subsp. *aberrans*. Very likely plants of this type are not restricted to Indefatigable Island.

THE ATRIPLEX OF THE GALAPAGOS ISLANDS

BY JOHN THOMAS HOWELL

The *Atriplex* of the Galápagos Islands has long presented a problem as to its identity. It was first collected by Snodgrass and Heller on the Hopkins-Stanford Galápagos Expedition, 1898–1899, but, since the specimens were only in flower or young fruit, the material was left undetermined by B. L. Robinson who indicated two unnamed species in his Flora of the Galápagos Islands (Proc. Amer. Acad. 38: 134,—1902). Stewart on the expedition of the California Academy of Sciences in 1905 and 1906 also collected the *Atriplex* but his collection added nothing to our knowledge of the plant or its identity since the specimens were neither in flower nor fruit. No further collections were made until 1932 when I collected flowering and fruiting specimens on the Templeton Crocker Expedition of the California Academy of Sciences. Even with adequate material for determination, the plant still remained difficult and puzzling and several attempts to identify it with species on the mainland of South America failed.

During the summer of 1935, both in Europe and in the larger herbaria of the eastern United States, I examined South American collections of *Atriplex* in hope of finding a clue to relationship. In Europe no specimen was seen that suggested a solution of the problem but in America a collection made by Weberbauer in Peru *(No. 5735,* F, G, US) and determined as *A. peruviana* Moq. seemed to represent a mainland plant related to the one on the islands. Paul C. Standley kindly sent to the California Academy of Sciences a liberal fragment from the Weberbauer collection in the Chicago Museum as well as a photograph of the type

of *A. peruviana* which further confirmed the relationship of the Galápagos saltbush.

In spite of the obvious relationship, the fruiting bracts of the Galápagos plant did not match sufficiently closely the bracts of Weberbauer's plant, while they did seem to correspond more closely to details given in the original description (DC. Prodromus 13, pt. 2: 102,—1849). In order to determine which sort of fruiting bract more nearly corresponded to the fruiting bracts of the type, material was sent to Prof. Hochreutiner at the Conservatoire et Jardin Botaniques in Geneva for comparison with the type which is in herb. DeCandolle. Prof. Hochreutiner in turn sent drawings of fruiting bracts of the type and loaned me two bracts for examination in San Francisco. From all this, it seems clear that the Galápagos plant is nearer typical *A. peruviana* than is Weberbauer's *No. 5735* but that both variants may be referred to that species. That the exact interpretation of *A. peruviana* still remains a problem on the mainland is inferred by Standley in his remarks on the species in Macbride's Flora of Peru (Field Mus. Nat. Hist., Bot. Ser., 13, part II:477,—1937).

A comparison of the fruiting bracts of the type with those of the insular material shows some divergence in variation. The fruiting bracts of the type are characterized by a peculiar swollen bony substipitate base below the expanded quadrilateral herbaceous part. The sides are smooth or more or less crested and the free margins which extend down to the acute lateral angles are entire or bear one or two teeth. In the island plants the sides of the bracts vary from smooth to very strongly crested; and, although nearly always the shape of the herbaceous part is more generally triangular, bracts are not uncommon which have the prominent lateral angles and quadrilateral rhomboidal shape found in the type.

As might be expected, there is some variation in the specimens from the different islands of the archipelago, not only in fruiting bracts but also in foliage. When further collections of plants can be assembled, not only from the different islands but also from the mainland, it may be found that more than one specific or subspecific entity is involved; but for the present, especially when we recall the great variability characteristic of many species of *Atriplex,* I believe that the Galápagos saltbush should be called *A. peruviana* Moq. Moreover this view, that the same saltbush occurs on both the islands and the mainland, adds another

example supporting the conclusion reached by Svenson (Amer. Journ. Bot. 33: 496,—1946), that the flora of the Galápagos Islands is very closely related to and largely derived from the xerophytic flora of coastal Peru and Ecuador.

On the Galápagos Islands I saw *A. peruviana* only near the shore along the landward border of calcareous beaches and it was noted as abundant at two stations where I collected it. In the original description the species is indicated as an annual with herbaceous stems, but a study of the photograph of the type shows material that would scarcely warrant such a conclusion. In the Galápagos Islands the plant is generally a low loosely branched soft-woody shrub up to a meter in height, but in the company of taller supporting plants it may become twice as tall. A description of the Galápagos saltbush, together with a list of collections studied, follows:

Shrub 1–2 m. tall; stems woody below, angled and covered with a thin close scurf above; leaves pale with a close or loose scurf, entire or undulate, ovate-lanceolate to rhombic-ovate, widest below the middle, rounded-cuneate or even truncate at base, acute or obtuse, frequently mucronulate at apex, 0.5–3 cm. long, 0.2–2 cm. wide, reticulately few-veined on lower side, the veins more or less paired or alternate, 1–3 on each half, petiole 0.2–1 cm. long; plants monoecious but tending to be dioecious, the staminate flowers in terminal or axillary panicles, the pistillate flowers axillary or disposed in glomerules in the lower part of the staminate inflorescence; calyx of staminate flowers densely scurfy except on scarious magins of lobes; fruiting bracts united to middle, generally 4–6 mm. long, 3–4 mm. wide, the sides prominently corky-crested or rarely quite smooth, widest at about the middle or below, rhombic, the free part generally entire or with a pair of salient teeth near the middle.

INSULAR COLLECTIONS EXAMINED: Indefatigable Island, *Chapin 1135*, north side, *Snodgrass & Heller 676, Stewart 1346, Howell 9878;* North Seymour Island, *Snodgrass & Heller 571, Howell 9977;* Wenman Island, *Snodgrass & Heller 9.*

BIOGRAPHICAL ADDITIONS AND CORRECTIONS

BY ELLA DALES CANTELOW AND HERBERT CLAIR CANTELOW

Since the publication of our "Biographical notes on persons in whose honor Alice Eastwood named native plants" (Leafl. West. Bot. 8:83–101), several corrections and additional details have come to our attention. We are grateful for the interest of Dr. H. W. Rickett, Bibliographer at the New York Botanical Gar-

den, who has corresponded with us about several of these matters.

HALEY, DR. GEORGE. All publications except one give his birth date as 28 Nov. 1870, instead of 27 Nov., as given by us (p. 91).

HENDERSON, LOUIS FORNIQUET. According to the "Register Guard" (Eugene, Oregon), he died in Tacoma, Wash., 14 June 1942.

MACOUN, JOHN. The place of his birth in Ireland was Maralin, not Marlin (p. 95).

PURDY, CARL. According to his son, Elmer, his full name was Carlton Elmer Purdy. Charlton (p. 97) was an error copied from a Ukiah newspaper.

TRASK, MRS. BLANCHE. According to her daughter, Caroline Trask, her maiden name was Engle, not Engles, and she was born in Waterloo, Iowa, not in Austin, Minn. (p. 100).

THE GRASSES OF SAN FRANCISCO, CALIFORNIA

BY PETER H. RAVEN
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In connection with a forthcoming work on the flora of San Francisco by J. T. Howell, Peter Rubtzoff, and the writer, a study of the Grass Family disclosed several interesting facts with regard to the number of species and to the composition of the grass flora of this rather limited area, most of which is under heavy industrial and residential use. In the 45 square miles in the City and County of San Francisco, 135 species of grasses have been found, a figure which compares impressively with the 151 species found in the 529 square miles of Marin County just to the north across the Golden Gate (Howell, Marin Flora, 1949). In addition, 12 named varieties and forms have been found in San Francisco, 10 in Marin County. These statistics would be startling, when we keep in mind the larger size and greater ecological diversity of Marin County, if it were not for a significant difference in the composition of the respective grass floras. Of the 135 species of the Grass Family in San Francisco, 85 have been introduced by man, either by accident or on purpose,

whereas only 65 introduced species were found in Marin County.

A remark made by Howell about Marin County introductions applies equally to those of San Francisco: "Some of these aliens are among the rarest and most localized of the . . . grasses, but a considerable number are very widespread and commonly constitute the dominant elements in much of the grassland of the region" (Leafl. West. Bot. 4: 244,—1946). For example, *Eremochloa ciliaris* (L.) Merr. is known in the United States only as a waif near a Chinese warehouse, where it was collected by H. N. Bolander in the early days of the city. On the other hand, there is hardly a patch of ground which does not provide a suitable habitat for such species as *Poa annua* L., *Bromus rigidus* L., and *B. mollis* L.

The 50 native species, in marked contrast to such successful aliens, are mostly uncommon or restricted in area at the present time. One of them, *Elymus vancouverensis* Vasey, seems to reach a southern distributional limit in San Francisco, and four others, which have not been collected in recent years, apparently did also: *Agrostis pallens* Trin., *Deschampsia caespitosa* (L.) Beauv. subsp. *caespitosa, Glyceria leptostachya* Buckl., and *Phleum commutatum* Gaud. In addition to these native species, there have been no recent collections of any species of *Bromus* sect. *Bromopsis, Phragmites communis* Trin., *Spartina foliosa* Trin., or *Torreyochloa pauciflora* (Presl) Church. The majority of these were found in marshes and clayey flats, perhaps mostly in the valuable industrial land of the Mission district, and would not be expected at the present day. *Agrostis pallens* and *Phleum commutatum,* however, are members of coastal communities of dunes and bluffs, and may persist to the present day. Many native species are now restricted to single stations, so it is perhaps not unreasonable to postulate a similar condition for these two, in which case they might have been overlooked in our survey. At least one member of the native grass flora, *Festuca megalura* Nutt., has exhibited marked weedy tendencies, and hence has probably increased with the urban development, but most others have decreased greatly.

Some of the adventive species, too, have not been collected in recent years. This is probably due to the early collection of sporadic introductions which never did become well established, but may also be due in part to the general reduction of land area available to non-cultivated plant species. Others have ap-

parently increased greatly since they were first noted by various authors of the late nineteenth century, such as Katharine Brandegee, H. N. Bolander, and H. H. Behr. This clearly indicates the value of collection and observation of the waifs and garden fugitives of today, for they may well become the competitive weeds of tomorrow.

The limited and heavily urbanized area of San Francisco has yielded many interesting facts, not only about its grasses but also about its other plants. We have felt that it is urgent that we assemble and record what information we can about its fragmentary flora, for even present fragments are rapidly being reduced. Even as this is being written, power equipment is biting deep into the lower slopes of the Bayview Hills (having probably already destroyed the only known San Francisco station for *Stipa cernua* Stebbins & Love), and it appears but a matter of time until the scenic chert-crowned summit of those hills will be degraded to furnish fill for tidal shallows of the bay.

HELEOCHLOA ALOPECUROIDES IN WASHINGTON. A recent collection from the margin of the Columbia River at Sacajawea State Park (just below the confluence of the Snake River), Franklin Co., Washington, September 2, 1956 *(Raven 10349),* has proven to be *Heleochloa alopecuroides* (Pill. & Mitterp.) Host. In Hitchcock's Manual of the Grasses of the United States (second edition, 1950, p. 433), where the distinctive characters of this European species are pointed out, it is listed from two localities, namely, Philadelphia, Pennsylvania, and near Portland, Oregon. Presumably the basis for the latter citation is a collection, of which a duplicate is in the herbarium of the California Academy of Sciences, labeled "Near a pond on bottom-land at Lower Albina, Portland, Multnomah County, Oregon, 1. Sept., 2. Nov. 1911," *Suksdorf 1672* (determined by A. S. Hitchcock). Although the species is not mentioned in Peck's Manual of the Higher Plants of Oregon (1941), it seems likely that it will be found elsewhere on the bottom-lands of the Northwest, just as *H. schoenoides* (L.) Host has spread in similar situations in California.—PETER H. RAVEN.

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JOHN THOMAS HOWELL

A TENTATIVE KEY TO THE SOUTH AMERICAN SPECIES OF ABUTILON, MILLER

BY THOMAS H. KEARNEY (†)

The characterizations in this key are based, whenever possible, upon examination of herbarium specimens and (or) photographs of types, but, for many of the species, published descriptions were the only available source of information. In such cases, especially, the characterizations are subject to correction. Juxtaposition of species in this purely artificial key does not necessarily imply close relationship. The segregate genera *Bakeridesia* Hochr., *Bogenhardia* Reichenb. (*Gayoides* Small) and *Corynabutilon* (K. Schum.) Kearney are not included. This is, perhaps, the most difficult of the genera of *Malvaceae,* an "umfangreiche und schwierige Gattung," as Garcke characterized it in a paper (Bot. Jahrb. 15:480–491) devoted mainly to a criticism of Schumann's treatment of the genus in Flora Brasiliensis (12^3: 364–437). Note 1.

1. Calyx inflated (more or less utricular), the lobes not (seldom?) more (often much less) than ½ as long as the tube. Leaves truncate or cordate at base; flowers solitary, on long, very slender peduncles; petals (20) 30–40 mm. long, narrow; androecium more or less exserted; carpels 5 or 6, pluriovulate. Note 2. (2).
1. Calyx otherwise, if somewhat inflated (in *A. thyrsodendron*), then deeply cleft (3).
2. Leaves rarely slightly 3-lobed, elongate-deltoid or ovate-oblong, rather finely serrate or dentate; petals pale yellow; mature fruit unknown. Calyx commonly red or brown. Southern Brazil..... .....*A. megapotamicum* (Spreng.) St. Hil. & Naud.
2. Leaves distinctly 3–5-lobed, broadly ovate, irregularly and coarsely serrate; petals drying pink; carpels muticous, villous, about 15 mm. long. Southern Brazil.....*A. inflatum* Garcke & K. Schum. Note 3
3. Flowers relatively large, the petals 25 mm. or longer (4).
3. Flowers smaller, the petals less than 25 mm. long (45).
4. Leaves peltate. Plants shrubby or arborescent; calyx cleft about ⅔, the lobes deltoid-lanceolate, acuminate; petals about 35 mm. long; carpels 8, ⅗–⅘ as long as the calyx, pluriovulate, hirsute, muticous or slightly apiculate (5).

(†) This is the second paper dealing with the taxonomy of *Malvaceae* to be published with aid from the T. H. Kearney Memorial Fund of the California Academy of Sciences. The first dealt with South American *Hibiscus* and was published in this journal last year (8: 161–168).—J. T. H.

Leaflets of Western Botany, Vol VIII, pp. 201–224, February 5, 1958.

4. Leaves not peltate but sometimes appearing so when deeply cordate and with overlapping basal lobes (6).
5. Blades not lobed, rounded at base, the margins subentire; petals pale yellow. Brazil (Minas Geraës).....*A. peltatum* K. Schum.
5. Blades distinctly 3-lobed, cordate at base, the margins conspicuously dentate; petal color not described. Brazil (Rio de Janeiro).....
.....*A. fluviatile* (Vell.) K. Schum.
6. Leaves conspicuously and often deeply lobed above the base. Carpels pluriovulate (7).
6. Leaves (except sometimes in *A. Bedfordianum, A. insigne,* and *A. Sellowianum*) not conspicuously although sometimes very shallowly lobed (13).
7. Petals white, strongly veined, 25–35 mm. long, suborbicular, abruptly long-clawed. Flowers subcorymbosely clustered at ends of the stems and branches; androecium nearly equalling the petals; carpels about 10, muticous or nearly so, 12–16 mm. long. Argentina.....
.....*A. niveum* Griseb.
7. Petals not white (8).
8. Calyx cleft nearly to the base, the lobes lanceolate, attenuate-acuminate. Petals yellow or red, conspicuously veined (9).
8. Calyx less deeply cleft or the lobes broader (10).
9. Herbage glabrous or nearly so; leaves cleft nearly to the base, the lobes narrow; petals 35–55 mm. long; carpels about 13 in number, 17–18 mm. long, not more than ½ as long as the calyx, rounded and muticous at apex. Southern Brazil, cultivated elsewhere in South America.
.....*A. venosum* Lem. Note 4
9. Herbage more or less tomentose when young; leaves less deeply cleft and the lobes broader; petals 22–25 (40?) mm. long; carpels 8, the mature fruit unknown. Southern Brazil.....*A. Darwinii* Hook. f.
10. Stems and leaves glabrous or glabrescent. Flowers axillary, long-pedunculate, more or less nutant; petals 25–40 mm. long, deep yellow with conspicuous reddish veins; androecium often conspicuously exserted; carpels about 11, 7–9-ovulate. Colombia, Peru, Brazil, Uruguay, Argentina; North America, where probably only an escape from cultivation.....*A. striatum* Dicks. Note 5
10. Stems and leaves more or less tomentose, at least when young (11).
11. Carpels 10, with 9–11 ovules; petals 45–55 mm. long, red. Leaves discolorous, whitish-velutinous beneath; androecium exserted; mature fruit unknown. Brazil (Santa Catarina).....
.....*A. Muelleri-Friderici* Gürke & Schum. Note 6
11. Carpels more numerous, with 4–6 ovules; petals 35–45 mm. long (12).
12. Plants up to 1 m. high; peduncles up to 8 cm. long; calyx coarsely papillate, strongly nerved; petals orange-yellow; carpels about ½ as long as the calyx. Brazil (Minas Geraës, São Paulo).....
.....*A. Regnellii* Miq. Note 7
12. Plants up to 4 m. high; peduncles up to 15 cm. long; calyx not papillate, obscurely nerved; petals violet (?); carpels about ¾ as long as the calyx. Brazil (Minas Geraës).....*A. pedrae-brancae* K. Schum.

13. Leaves distinctly to conspicuously asymmetric (oblique at base), ½–⅔ as wide as long. Carpels plurioculate (14).

13. Leaves (so far as is known except sometimes in *A. geminiflorum, A. Mouraei, A. Schenckii,* and perhaps, *A. insigne)* symmetric or nearly so (18).

14. Corolla 25–30 mm. long (15).

14. Corolla 35–40 mm. long (17).

15. Petals becoming reflexed; leaves subsessile, with the deeply cordate base amplexicaul, discolorous. Flowers solitary, nodding, the peduncles long and slender; calyx campanulate, cleft about ½ way, the lobes lanceolate; petals pink, oblanceolate; carpels about 16, pluriovulate(?); mature fruit unknown. Peru.....*A. piurense* Ulbr. Note 8

15. Petals not becoming reflexed; leaves distinctly petiolate (16).

16. Flowers in several-flowered axillary racemes; leaves cordate at base; petals probably yellow, with red veins. Southern Brazil.....
.....*A. appendiculatum* K. Schum. Note 9

16. Flowers solitary or geminate in the axils; leaves obliquely subcordate at base, crenate or serrulate; petals yellow or yellowish, drying pink. Carpels numerous, rounded at apex, muticous, somewhat inflated. Colombia, Venezuela.....*A. Woronovii* Ulbr. Note 10

17. Leaves truncate or subcordate at base; calyx 5-ribbed and somewhat winged at base; petals white. Southern Brazil..*A. inaequale* K. Schum.

17. Leaves cordate at base, sharply attenuate-acuminate; calyx 10-nerved; petals presumably purple. Peduncles very slender; fruit truncate, the carpels about 10, slightly apiculate. Brazil.....*A. Glaziovii* K. Schum.

18. Petals becoming more or less reflexed. Carpels pauciovulate (19).

18. Petals (so far as is known) not becoming reflexed (23).

19. Inflorescence a terminal raceme. Peduncles subtended by long, tricuspidate bracts; calyx not at all angulate, rounded at base; petals 26–28 mm. long, ⅓ as wide, ochroleucous with a purple basal spot; androecium about equalling the petals, the stamens in 5 fascicles; ovary constricted at the middle; carpels about 13, described as uniovulate; mature fruit unknown. Colombia.....
.....*A. oxypetalum* Planch. & Lind. Note 11

19. Inflorescence otherwise. Carpels with 2 or 3 ovules (20).

20. Corolla brick-red, 35–40 mm. long. Leaves coarsely crenate-dentate, suborbicular, deeply cordate, abruptly short-acuminate, nearly concolorous except when young; flowers long-pedunculate, subnutant; petals about ⅓ as wide as long; carpels very numerous, thin, conspicuously cuspidate, less than ½ as long as the calyx, separating at maturity. Peru.....*A. lateritium* Ulbr.

20. Corolla yellow or purple (21).

21. Peduncles shorter than to little-surpassing the subtending leaves; stamen-tube densely white-lanate at base; petals about 30 mm. long, obovate, pale yellow when dry. Leaves short-petiolate; carpels numerous, about ½ as long as the calyx, obliquely acute, tomentose. Ecuador.....
.....*A. pubistamineum* Ulbr.

21. Peduncles mostly greatly surpassing the subtending leaves; stamen-tube glabrous; petals narrowly spatulate, not more than 1/5 as wide as long, purple. Carpels villous (22).

22. Stems with long, slender, spreading or reflexed, presumably simple hairs; peduncles up to 20 cm. long, filiform; carpels about 20, aristate. Colombia (?) and Ecuador or Peru.....*A. pedunculare* H.B.K.

22. Stems otherwise pubescent, the hairs usually all short and mostly stellate; peduncles up to 12 cm. long, slender but not filiform; carpels 12–14, with a short, oblique beak. Petals about 35 mm. long. Peru.....
.....*A. reflexum* (Juss. ex Cav.) Sweet

23. Calyx tubular or tubular-campanulate, cleft not more than about 1/3-way from the apex. Leaves attenuate-acuminate (24).

23. Calyx campanulate, usually more deeply cleft (25).

24. Leaves lanceolate, about 1/6 as wide as long, denticulate to subentire, cuneate or truncate at base; carpels pluriovulate; petals, when dry, purple with darker veins, 30–40 mm. long. Androecium as long as or longer than the petals; carpels 9, muticous, about 17 mm. long. Brazil (Minas Geraës).....*A. longifolium* K. Schum.

24. Leaves ovate or deltoid-ovate, 1/3 to nearly as wide as long, crenate or crenate-serrate, cordate at base; carpels pauciovulate; petals white, with red or purple veins, 40–50 mm. long. Plants shrubby, up to 1 m. high; herbage ferruginous-pubescent; leaves (the lower ones) 3-lobed; flowers pendulous; mature fruit unknown. Venezuela.....
.....*A. insigne* Planch.

25. Width of the leaf-blades (except sometimes in *A. elegans, A. Schenckii,* and *A. sylvaticum)* not more and commonly less than 2/3 of the length (26).

25. Width of the leaf-blades (except sometimes in *A. peruvianum*?) seldom less and usually more than 2/3 of the length (33).

26. Petals yellow or whitish. Leaves attenuate-acuminate; flowers 1–3 in the axils (27).

26. Petals (in *A. amoenum*?, *A. elegans*?) pink, red, purple, or purple-veined. Carpels pluriovulate (29).

27. Leaf-bases distinctly cordate. Plants shrubby, up to 3 m. high; petals 35 (-40?) mm. long, more than 2/3 as wide; carpels 9–16, pluriovulate, somewhat inflated, muticous or nearly so, about 15 mm. long, tomentose dorsally. Peru, Bolivia....*A. sylvaticum* (Cav.) K. Schum. Note 12

27. Leaf-bases truncate, rounded or subcordate (28).

28. Corolla ochroleucous, 25–30 mm. long; leaf-margins serrate; petioles 1/5–1/3 as long as the blades; carpels pluriovulate, about 13 in number, obtuse. Brazil (Rio de Janeiro).....*A. Schenckii* K. Schum. Note 13

28. Corolla orange-yellow, 30–35 mm. long; leaf-margins entire; petioles not more than 1/6 as long as the blade; carpels pauciovulate. Leaves narrowly ovate or subrhombic, less than 1/2 as wide as long, long-attenuate-acuminate, rounded or subcordate at base; peduncles up to 4 cm. long; androecium about 1/2 as long as the petals; mature fruit unknown. Colombia .. ..*A. Goudotianum* Tr. & Planch.

29. Leaves seldom more than ⅓ (usually 1/6–¼) as wide as long, elliptic or elliptic-lanceolate. Pubescence usually ferruginous, especially on the leaf-nerves; carpels about 15, rounded at apex, muticous, 10–12 mm. long, shorter than the calyx. Brazil.....*A. rufinerve* St. Hil. Note 14

29. Leaves ½–⅔ or more as wide as long (30).

30. Calyx 20–25 mm. long (31).

30. Calyx 30–35 mm. long (32).

31. Petals dull pink, the short claws pale yellow; carpels about 13 mm. long, about ½ as long as the calyx, muticous. Leaves sometimes distinctly 3-lobed, somewhat discolorous. Southern Brazil.....*A. Sellowianum* (Klotzsch) Regel. Note 15

31. Petals purple; carpels 20–22 mm. long, about equalling the calyx, obtuse. Leaves more or less abruptly narrowed from the middle. Brazil (Minas Geraës).....*A. montanum* St. Hil.

32. Carpels 12; petals broadly obovate. Southern Brazil.....*A. amoenum* K. Schum.

32. Carpels 8; petals elliptic. Brazil (Rio de Janeiro, Minas Geraës).....*A. elegans* St. Hil.

33. Leaf-margins entire. Plants shrubby or arborescent; leaves suborbicular, shallowly cordate with an open sinus, shortly acuminate; petals up to 45 mm. long, slightly 2-lobed, deep yellow; androecium about ⅓ as long as the petals; carpels pauciovulate; mature fruit unknown. Colombia, Venezuela.....*A. integerrimum* (Hook.) Turcz. Note 16

33. Leaf-margins crenulate, crenate, or serrate, sometimes obscurely so (34).

34. Flowers mostly in paniculate or subcorymbose terminal inflorescences (35).

34. Flowers 1–3 in the axils (38).

35. Calyx externally rugose and densely woolly; petals dark- or violet-purple, up to 50 mm. long; stipules small, subulate, caducous. Leaves broadly ovate or suborbicular, deeply cordate, crenate or crenulate, strongly discolorous; flowers mostly in small, subcorymbose, terminal clusters; carpels muticous, 14 mm. long, about ½ as long as the calyx, pluriovulate. Brazil.....*A. macranthum* St. Hil. Note 17

35. Calyx otherwise; petals (in *A. cyclonervosum*?) yellow; stipules large, more or less persistent (36).

36. Leaves nearly concolorous; petals about 45 mm. long, the color unknown. Carpels 14–16, pluriovulate; mature fruit unknown. Bolivia.....*A. cyclonervosum* Hochr.

36. Leaves more or less discolorous; petals not more than 40 mm. long. Leaves sometimes shallowly 3-lobed; carpels muticous or nearly so, very pubescent (37).

37. Calyx about 25 mm. long, cleft about ⅔ of its length; petals 30–40 mm. long, conspicuously veined, contracted into a rather long claw; carpels pauciovulate, 15–20 mm. long. Leaf-margins crenate-dentate; stipules deltoid; androecium slightly longer than the petals. Bolivia.....*A. Bakeri* Rusby. Note 18

37. Calyx about 18 mm. long; petals 25–30 mm. long, yellow, not (?) conspicuously veined; carpels pluriovulate. Brazil (Matto Grosso).....
.....*A. Malmeanum* R. E. Fries

38. Petals blood-red, 30–35 mm. long, 1/5–1/4 as wide. Shrub about 3 m. high; stems hirsute with long, simple, retrorse hairs and also tomentulose; leaves up to 16 cm. long and 3/4 as wide as long, deeply cordate with a closed sinus so as to appear peltate, acuminate, sparsely denticulate to subentire, discolorous; peduncles slender, much surpassing the subtending leaves, up to 18 cm. long; carpels about 20 mm. long, about 2/3 as long as the calyx, obliquely truncate at apex, pauciovulate. Peru.....*A. pionense* Ulbr. Note 19

38. Petals (in *A. Mouraei*?) otherwise colored, at least 1/2 as wide as long (39).

39. Carpels 25 or more, 1-ovulate or with an additional aborted ovule. Shrub about 1 m. high; leaves up to 5.5 cm. long and nearly as wide as long, finely serrulate, discolorous; stems more or less tomentose and with long, simple hairs; corolla about 30 mm. long, bright yellow with a dark-purple center; mature fruit unknown. Northeastern Brazil.....
.....*A. monospermum* K. Schum.

39. Carpels (in *A. longipes*?) fewer, normally pluriovulate (40).

40. Corolla rose-pink. Lower leaves obscurely trilobate; mature fruit unknown. Northern Argentina.....*A. jujuiense* Hassler

40. Corolla (in *A. Mouraei*?) yellow or ochroleucous, sometimes conspicuously red-veined (41).

41. Stipules narrow, seldom more than 1.5 mm. wide at base; carpels 8–14 (42).

41. Stipules broader, about 2.5 mm. wide at base, becoming reflexed; carpels (in *A. longipes*?) 12 or more. Leaves usually discolorous; calyx usually cleft to below the middle, the lobes lanceolate or ovate-lanceolate, acuminate; petals (30?) 35–40 mm. long, pale yellow or whitish (44).

42. Stems with longish simple hairs, also tomentellous; leaves strongly discolorous. Petals up to 40 mm. long, abruptly contracted into a rather long claw, the color unknown; mature fruit unknown. Southern Brazil.....*A. Mouraei* K. Schum.

42. Stems glabrous or puberulent, without long hairs; leaves (except in *A. Bedfordianum* var. *discolor)* nearly concolorous (43).

43. Petals 30–35 mm. long, 3/5–2/3 as wide as long, yellow with conspicuous red or purple veins; carpels 8–10 in number, 12–15 mm. long, nearly as long as the calyx. Southern Brazil.....
.....*A. Bedfordianum* (Hook.) St. Hil. & Naud. Note 20

43. Petals up to 50 mm. long, about 1/2 as wide as long, pale yellow (?); carpels about 13, the mature fruit apparently unknown. Venezuela.
.....*A. geminiflorum* H.B.K. Note 21

44. Peduncles shorter than the subtending leaves; blades crenate. Ecuador (?), Peru, Bolivia.....A. peruvianum (Lam.) Kearney. Note 22

44. Peduncles longer than the subtending leaves, up to 16 cm. long; blades denticulate. Peru.....*A. longipes* Ulbr. Note 23

45. Petals 15 mm. or longer (46).

45. Petals not more, usually less than 15 mm. long (62).

46. Leaves conspicuously lobed. Flowers nutant, 1–3 in the axils; petals 22–25 mm. long, yellow outside, pink within and with purple veins and basal spot; carpels 8, pluriovulate; mature fruit unknown. Southern Brazil.....*A. Darwinii* Hook. f.

46. Leaves not lobed, or shallowly and inconspicuously trilobate (47).

47. Flowers in paniculate, corymbiform, or umbelliform inflorescences. Carpels pauciovulate (48).

47. Flowers mostly solitary or binate (exceptionally ternate) in the axils, but the inflorescences sometimes subpaniculate or subcorymbose by the development of accessory, axillary branchlets (52).

48. Ovules not in a vertical series, the 2 upper ones collateral and the lower one solitary, as in *Wissadula*. Plants shrubby or arborescent, up to 10 m. high; stems terete; stipules broad, very caducous; leaves up to 11 cm. long, attenuate-acuminate; flowers in an ample, open panicle; calyx angulate, tomentose, accrescent and becoming somewhat inflated; petals 15–18 mm. long and about ⅔ as wide; carpels 4–6, shorter than the calyx, obovoid-trigonous, thin-walled, inflated. Bolivia and northwestern Argentina...*A. thyrsodendron* Griseb. Note 24

48. Ovules (so far as is known) all in one vertical series (49).

49. Corolla white tinged with purple, about 20 mm. long; style-branches slightly enlarged toward apex, these and the capitate stigmas dark-purple. Plants shrubby; leaves ⅔ to nearly as wide as long, deeply cordate with a closed sinus, subcrenulate to coarsely serrate, moderately discolorous; inflorescences corymbiform-paniculate; carpels 9 (–15?), rounded at apex, about 9 mm. long. Bolivia.....
.....*A. fusicalyx* Ulbr. Note 25

49. Corolla yellow to deep orange, sometimes tinged with or fading pink; styles and stigmas otherwise (50).

50. Inflorescences subtended by long, narrow, stipule-like bracts, subcapitate-umbelliform. Plants herbaceous or suffrutescent; stems yellowish-tomentellous and with long, very fine, simple hairs below the inflorescence; leaves strongly discolorous, long-petiolate, deltoid-ovate or oblong-ovate, cordate, coarsely crenate-serrate, sometimes slightly trilobate; petals 15–20 mm. long, yellow (?) when fresh, drying red or pink; carpels about 10, trigonous, obtuse and muticous. Southern Brazil, Uruguay, and northern Argentina.....
.....*A. malachroides* St. Hil. & Naud. Note 26

50. Inflorescences not so subtended (51).

51. Carpels 13 or fewer; stems usually more or less hirsute with very long, spreading, simple hairs in addition to other pubescence. Leaves commonly about as wide as long; flowers in relatively short, axillary and terminal umbelliform clusters; carpels muticous or nearly so, conspicuously and densely hirsute. Southern Brazil, Paraguay, northern Argentina.....*A. umbelliflorum* St. Hil. Note 27

51. Carpels about 20; stems not conspicuously hirsute, the simple hairs, if any, much shorter. Petioles up to 12 cm. long; leaf-nerves 11–13; petals 15–18 mm. long, not more than ⅓ as wide, yellow; calyx in fruit 8–10 mm. long; carpels 9–12 mm. long, but the fruit much sur-

passing the somewhat explanate calyx. Colombia, Ecuador.....
.....*A. ibarrense* H.B.K.

52. Fruit of numerous (commonly about 20) thin-walled carpels (53).

52. Fruit of 12 or fewer carpels (55).

53. Petals narrow, purple; carpels aristate, ½ as long as the calyx, without (?) attaching threads, pluriovulate. Peduncles mostly greatly surpassing the subtending leaves, up to 20 cm. long, very slender. Colombia (?), Ecuador (?), Peru.....*A. pedunculare* H.B.K.

53. Petals broad, orange- or tawny-yellow with a dark basal spot; carpels muticous or apiculate, nearly as long as to longer than the calyx with attaching threads, pauciovulate. Stems usually with long, spreading, simple hairs in addition to other pubescence. Old World species, introduced in South America (54).

54. Herbage more or less glandular; petals 15–20 mm. long. Venezuela, Peru, and probably elsewhere in South America.....
.....*A. hirtum* (Lam.) Sweet. Note 28

54. Herbage not glandular; petals usually less than 15 mm. long. Leaves often coarsely dentate. Colombia, Guiana, Peru, Brazil.....
.....*A. indicum* (L.) Sweet

55. Petals (so far as is known) pink, red, or purple, at least when dry (56).

55. Petals yellow. Leaves velutinous, broadly ovate or suborbicular (60).

56. Petioles relatively short, usually less than 5 cm. long. Leaves ½–⅔ as wide as long; flowers axillary (often geminate) and in small terminal clusters; androecium aboutt ⅔ as long as the corolla; carpels about 10, pluriovulate, 10–15 mm. long, short-beaked or muticous. Brazil.
.....*A. esculentum* St. Hil. Note 29

56. Petioles elongate, 5–15 cm. long (57).

57. Leaf-bases truncate-subcuneate. Plants arborescent-shrubby, up to 6 m. high; leaves ¾ as wide as long; flowers 2–4 in the upper axils and in subglobose, umbelliform, terminal clusters; androecium about ¼ as long as the dark-maroon petals; carpels 10–12, pluriovulate; mature fruit unknown. Brazil (Minas Geraës).....*A. Mexiae* R. E. Fries

57. Leaf-bases cordate (58).

58. Carpels 7, pauciovulate. Mature fruit unknown. Brazil.....
.....*A. minarum* K. Schum.

58. Carpels more numerous, pluriovulate (59).

59. Petioles mostly longer than the blades, these long-acuminate, sharply dentate. Carpels 10–11 mm. long, apiculate or cuspidate. Colombia.
.....*A. petiolare* H.B.K.

59. Petioles shorter than the blades, these shortly acuminate. Stems apparently without long, simple hairs; leaves finely dentate, with very numerous teeth; petals pink; carpels slightly to considerably longer than the calyx. Brazil (Rio de Janeiro).....
.....*A. carneum* St. Hil. Note 30

60. Carpels pauciovulate; petals less than 15 mm. long. Otherwise similar to *A. molle*. Eastern Peru.....*A. mollissimum* (Cav.) Sweet. Note 31

60. Carpels pluriovulate; petals 15–20 mm. long. Stems with long, spreading, simple hairs in addition to other pubescence (61).

61. Leaves seldom strongly discolorous; flowers often geminate. Southern Brazil, Argentina.....*A. molle* (Ortega) Sweet. Note 32

61. Leaves strongly discolorous; flowers always solitary. Plants suffruticose, rarely shrubby; leaves mostly short-acuminate, often slightly 3-lobed. Southern Brazil, Paraguay, Uruguay, Argentina.....
.....*A. pauciflorum* St. Hil. Note 33

62. Carpels 12 or more (63).

62. Carpels (except sometimes in *A. abutiloides, A. giganteum,* and perhaps *A. arequipense*) 10 or fewer, pauciovulate (67).

63. Flowers in more or less umbelliform inflorescences. Leaves more or less discolorous; carpels pauciovulate (64).

63. Flowers solitary in the axils but sometimes paniculately aggregated at ends of the stem and branches (66).

64. Inflorescences corymbiform, more or less subtended by narrow, stipule-like bracts; leaves oblong or oblong-lanceolate, up to 9 cm. long, 1/5–1/3 as wide as long; corolla yellow. Carpels 12–15 in number, 6–7 mm. long. Southern Brazil, Paraguay?, Uruguay?, Argentina.....
.....*A. affine* (Spreng.) G. Don. Note 34

64. Inflorescences not so subtended; leaves broader; corolla orange (65).

65. Stamen-tube stellate-hirsute; carpels nearly as long as the calyx. See first paragraph 51.....*A. umbelliflorum* St. Hil.

65. Stamen-tube glabrous; carpels considerably shorter than the calyx. Petioles up to 6.5 cm. long; leaf-nerves 9; petals 11 mm. long, nearly as wide, orange with darker veins; calyx 1.3–2 mm. long; Venezuela.
.....*A. cuspidatum* Pittier

66. Calyx very accrescent and enclosing the fruit, 20–25 mm. long at maturity, plicate-alate, cleft nearly to the base, the lobes suborbicular, deeply cordate, abruptly short-acuminate. Herbage densely soft-velutinous, with simple and stellate longish, spreading hairs; leaves ovate or ovate-lanceolate, up to 8 cm. long, 1/2–2/3 as wide, tapering from near base to apex, rather coarsely crenate; flowers solitary in the axils, the peduncles mostly shorter than the leaves; petals little if at all surpassing the calyx; carpels very numerous, pluriovulate, thin, 10–15 mm. long, aristate, villous, nigrescent. Paraguay and northern Argentina.....*A. Hassleranum* Hochr. Note 35

66. Calyx otherwise. Plants perennial (?); petals pure white, 12–15 mm. long, becoming reflexed; carpels pauciovulate, spreading at maturity, cuspidate; stems with rather long, spreading or reflexed, simple hairs; leaves up to 10 cm. long, 3/4–4/5 as wide, deeply cordate, rather abruptly acuminate, denticulate or subentire; androecium about 1/2 as long as the petals. Ecuador.....*A. multiflorum* R. E. Fries

67. Petals becoming reflexed (68).

67. Petals (so far as is known) not becoming reflexed, mostly yellow or yellowish, sometimes fading pink (70).

68. Petals suborbicular, violet; flowers axillary, solitary, long-pedunculate. Leaves 2–4.5 cm. long, oblong or ovate-oblong, shallowly cordate, crenulate, soft-tomentose on both surfaces; stems shortly stellulate-pubescent (sublepidote); stamen-tube densely pilose below the fila-

ments; style-branches filiform, slightly thickened toward apex, these and the small stigmas dark-violet; carpels 9–10, obtuse, 2-seeded. Peru.....*A. arequipense* Ulbr.

68. Petals narrower, yellow or whitish; flowers in an open, terminal, often nearly naked panicle (69).

69. Carpels 8–14 (16?), more or less aristate (exceptionally muticous and rounded or truncate at apex), 10–15 mm. long, villous; petals obovate-oblong, 9–15 mm. long, about ½ (?) as wide as long, often with a purple basal spot. Plants shrubby or arborescent; herbage velutinous, the stems and (or) petioles also with long, spreading, simple hairs; leaves broadly ovate or suborbicular, more or less cordate, sometimes slightly lobed; flower-buds angulate-turbinate; corolla often with a red or purple center. Venezuela to Peru; North America.....*A. giganteum* (Jacq.) Sweet. Note 36

69. Carpels 7–9 (12?), truncate and muticous or very nearly so at apex, 7–8 mm. long; petals narrowly oblong, 7 mm. long, about ⅓ as wide. Colombia and Venezuela.....*A. stenopetalum* Garcke

70. Ovules not in a vertical series, the 2 upper ones collateral, the lower one solitary, as in *Wissadula* (71).

70. Ovules (so far as is known) all in one vertical series (73).

71. Petals 6–9 mm. long; flowers very numerous, in a nearly leafless terminal panicle. Plants shrubby (or herbaceous?); stems trigonous and deeply sulcate above; leaves up to 18 cm. long, obtuse to short-acuminate; calyx globose in bud; carpels 6–7, about twice the length of the calyx, 7–8 mm. long, mucronulate to cuspidate. Brazil, Paraguay.....*A. ramiflorum* St. Hil.

71. Petals 12–15 mm. long; inflorescence otherwise (72).

72. Plants arborescent; flower-buds globose, rounded at base; carpels 6–8, long-rostrate, 1½ times as long as the calyx. Stems minutely stellate-pubescent, sometimes also with long, simple hairs; leaves thin, discolorous, acuminate at apex, prominently reticulate beneath, up to 16 cm. long; stamen-tube, fruit, and seeds white-pilose. Brazil.....*A. itatiaiae* R. E. Fries

72. Plants shrubby; flower-buds angulate, carpels 5, the mature fruit unknown. Leaves 2–4 cm. long, suborbicular, shortly acuminate, irregularly and coarsely dentate, sometimes slightly 3-lobed; flowers pendulous; calyx alate-pentagonous, cleft nearly to the base, the lobes cordate; petals 12–14 mm. long. Bolivia.....*A. Herzogianum* R. E. Fries

73. Flowers mostly in corymbiform, umbelliform, racemiform, or paniculate inflorescences (74).

73. Flowers mostly solitary in the axils but sometimes also more or less aggregated apically or in small axillary clusters or (in *A. divaricatum*) the inflorescence sometimes subpaniculate (79).

74. Carpels 5; petals not more than 8 mm. long (75).

74. Carpels (except sometimes in *A. umbellatum*) more than 5; petals (except sometimes in *A. umbellatum*) more than 8 mm. long (77).

75. Stems stellate-tomentellous below the inflorescence; leaves somewhat discolorous, persistently (?) softly-stellate-tomentose on both surfaces. Calyx in fruit about 8 mm. long, nearly equalling the aristate carpels. Brazil.....*A. aristulosum* K. Schum.

75. Stems stellulate-puberulent below the inflorescence; leaves nearly concolorous (76).

76. Carpel-body about 4 mm. long, the awns 2.5–3 mm. long. Bolivia.....*A. benense* (Britton) Baker f. Note 37

76. Carpel-body 6 mm. long, the awns 5 mm. long. Paraguay.....*A. Balansae* (Hassler) Hassler. Note 38

77. Inflorescences becoming loosely racemose, up to 20 cm. long but usually shorter; carpels very obtuse, muticous, silky-villous, about 9 in number, 8–10 mm. long. Leaves deltoid-ovate, cordate, crenate, up to 4 cm. long, ½ to equally as wide as long. Brazil, Uruguay, Argentina. .....*A. terminale* (Cav.) St. Hil.

77. Inflorescences otherwise; carpels cuspidate or aristate (78).

78. Flowers axillary and also racemosely or subcorymbosely clustered at ends of more or less elongate axillary branchlets, the inflorescence, when well developed, a very open, leafy panicle. Stems not conspicuously hirsute, the simple hairs, if any, relatively short; leaves commonly longer than wide; petals 10–15 mm. long; carpels conspicuously beaked, rather finely tomentose. Colombia; North America.....*A. abutiloides* (Jacq.) Garcke. Note 39

78. Flowers mostly in small corymbiform or subumbellate clusters at ends of the stem and axillary branchlets. Leaves sometimes shallowly trilobate; calyx hirsute; petals 8–10 mm. long; carpels 5–7, aristate, 6–8 (9?) mm. long. Venezuela and Colombia to Peru and Bolivia.....*A. umbellatum* (L.) Sweet. Note 40

79. Stipules 13–15 mm. long, about ⅓ as wide at the unequally auriculate base. Petals 10–13 mm. long, deep yellow; carpels about 10, apiculate, 1½–2 times as long as the calyx. Venezuela, Colombia, Peru, Brazil, introduced from the Old World....*A. auritum* (Wall. ex Link) Sweet

79. Stipules narrower and mostly shorter, not auriculate (80).

80. Carpels biovulate. Stems with few or numerous long, simple hairs in addition to other pubescence; leaves broadly ovate, deeply cordate, sharply acuminate, crenulate to rather coarsely dentate; calyx-lobes strongly ribbed; carpels 5 in number, 10–15 mm. long, aristate with erect awns, glandular-pilose as are the herbage and calyx. Ecuador. .....*A. divaricatum* Turcz. Note 41

80. Carpels triovulate, mostly long-cuspidate or aristate (81).

81. Leaves conspicuously asymmetric at base, ovate-oblong, up to 10 cm. long and not more than ½ as wide, rather finely and regularly crenate-serrate. Carpels about equalling the calyx, villous. Brazil.....*A. inaequilaterum* St. Hil.

81. Leaves symmetric or nearly so (82).

82. Blades discolorous, the lower surface much more pubescent than the upper, ovate or ovate-lanceolate, ½ or more times as wide as long, truncate or subcordate at base, sharply long-acuminate, denticulate.

Flowers small; carpels about 8, longer than the calyx. Brazil (Rio de Janeiro).....*A. neovidense* K. Schum. Note 42

82. Blades concolorous or nearly so (83).

83. Carpels commonly 8 or 9, long-cuspidate or aristate; leaves often shallowly 3-lobed. Stems subhirsute or (in var. *tomentosum* K. Schum.) velutinous with stellate hairs, sometimes also with long, simple hairs; flowers often several in the upper axils and the inflorescence becoming a leafy thyrse; fruit mostly considerably surpassing the calyx, more or less septicidal as well as loculicidal. Brazil, Peru, Bolivia, Chile, Argentina.....*A. virgatum* (Cav.) Sweet. Note 43

83. Carpels commonly 5–7; leaves not lobed or very obscurely so (84).

84. Stems tomentellous, without long, simple hairs; leaves shallowly dentate; some of the flowers often subumbellate on accessory branchlets; carpel-awns 1.5–2 mm. long. Galápagos Islands.....
.....*A. Anderssonianum* Garcke. Note 44

84. Stems with or without long simple hairs; leaves deeply dentate; flowers solitary, long-pedunculate; carpel-awns about 1 mm. long. Brazil, Argentina.....*A. saltense* Hassler. Note 45

NOTES

1. The following taxa are too little known for inclusion in this key: *A. Arnottianum* (Gill.) Walp. (Chile), *A. benedictum* Bunb. (Brazil), *A. circinnatum* (Willd.) G. Don (Brazil), *A. densiflorum* Walp. (Chile), *A. eximium* Lind. & Planch. (Venezuela), *A. globiflorum* (Hook.) G. Don, *A. hirsutum* (Vell.) K. Schum. (Brazil), *A. lineatum* (Vell.) K. Schum. (Brazil), *A. pilosum* (Vell.) K. Schum. (Brazil), *A. pyramidale* Turcz. (Colombia). *A. globiflorum* is probably an Old World species, although E. G. Baker (Journ. Bot. 31:271) assigned it to Peru or Chile, where it may have been cultivated. *A. benedictum* may be a *Bakeridesia,* since Baker (ibid.) thought it allied to *"A. rufivellum"* K. Schum., which is *Bakeridesia rufivela* Hochr. *A. quinquelobum* Ulbr. is certainly *Bakeridesia,* being based on the same type collection as is *B. senilis* (K. Schum.) Hochr. *A. scabridum* K. Schum., which Garcke (Bot. Jahrb. 15:408) thought to be the same as *A. truncatum* (Vell.) K. Schum., also should be transferred to *Bakeridesia. A. Weberbaueri* Ulbr., from Peru, is a *Bastardia. A. pulverulentum* Ulbr., from Peru, is a *Sida (S. pulverulenta* (Ulbr.) Kearney). *A. turumiquirense* Steyerm., from Venezuela, seems to be known only by the type collection, without flowers but with old dehiscent fruits. Its identity is uncertain but it does not seem to be an *Abutilon,* the ovule, apparently, being solitary and pendulous. It may represent an undescribed genus.

2. The term pluriovulate, as used in this key, signifies that the number of ovules in each carpel is 4 or more; and the term pauciovulate signifies that the number is not more than 3. Garcke (Bot. Jahrb. 15:483) considered the number of ovules an inconstant and unsatisfactory character, although Schumann in Flora Brasiliensis and most recent authors have used it as the principal basis for grouping the species. In the present artificial key, this character has been subordinated as far as is practicable.

3. Perhaps only a variety of *A. megapotamicum,* with lobed leaves.

4. *A. venosum* Lem. (Fl. Serr. Jard. 2^3: pl. 5, -1846), although stated to have come originally from Mexico, appears to be the same as *Sida venosa* Hook. (Bot. Mag. 75 : t. 4463, -1849), the latter being the basonym of *Abutilon venosum* (Hook.) Hook. ex Walp.

5. Synonyms: *A. pictum* (Gill.) Walp. and perhaps *A. Thompsoni* André.

6. Apparently very close to *A. senile*, which is a *Bakeridesia*.

7. Synonym: *A. septemlobum* Miq.

8. Ulbrich considered this species related to *A. megapotamicum*, but it differs in several characters. He did not state the number of ovules.

9. Garcke (Bot. Jahrb. 15:484) thought this to be identical with *A. inaequale*, but the descriptions in Fl. Bras. (12^3:407,408) indicate different plants.

10. A collection from near Caracas *(Pittier 9931)*, determined by Ulbrich as *A. Woronovii* var., was described by the collector as "shrubby, trailing, flowers yellowish white."

11. Schumann stated (Fl. Bras. 12^3:432) that, although anomalous in the uniovulate carpels, *A. oxypetalum* otherwise agrees with *Abutilon*. It would seem better, however, to transfer it to *Sida*. The constriction of the carpels suggests *Wissadula*, but the carpels are too numerous.

12. See Fl. Bras. 12^3:418, where the name is spelled *silvaticum*. Cavanilles (Diss. 2:56-57) described his *Sida sylvatica* as having "capsulae 30-36 compressae, muticae, monospermae," which certainly would not apply to the plant described by Schumann, but as Schumann himself pointed out (ibid., Obs.), Cavanilles' illustration (Diss. t. 133 f. 2) corresponds well with the plant described by Schumann. *A. laxum* Rusby is perhaps a synonym. Three subspecies of *A. silvaticum* (sic) were described by R. E. Fries (K. Sv. Vet. Akad. Handl. ser. 3, 24^2: 7-8). As compared with ssp. *genuinum*, ssp. *Buchtienii* seems to differ chiefly in the more caudate-acuminate calyx-lobes. Ssp. *Klugii* was described as having longer, ferruginous pubescence of the herbage and calyx, leaves less deeply cordate at base, stamens in 5 fascicles, and more numerous carpels.

13. Synonym (?) fide Garcke: *A. falcatum* St. Hil. & Naud., an older name. This was described as having a 9–10-merous ovary and carpels 20 mm. long at maturity.

14. Synonym (?): *A. paeoniflorum* (Hook.) Walp.

15. According to Garcke (Bot. Jahrb. 15:491), *A. Sellowianum* may be synonymous with *A. macrocarpum* St. Hil. & Naud. and *A. macrophyllum* St. Hil. & Naud. These taxa were too briefly and inadequately described to afford certain identification. Photographs of the types in the Paris Herbarium show, in the former, a leaf with 2 rather large, acutish teeth, and in the latter, a leaf with 2 very sharp but very short lateral lobes. The carpels were stated to be 12–15 in *A. macrocarpum*, the ovary polymerous in *A. macrophyllum*, and in both the carpels were described as having more than 4 ovules and muticous. A fruit from the type of *A. macrocarpum* has muticous carpels about ½ as long as the calyx, the latter about 2 cm. long, cleft nearly to the base with triangular-lanceolate, attenuate-acuminate lobes. The calyx of *A. macrophyllum*, as shown in the photograph, seems very similar. Since both photographs show the petals at least twice as long as the calyx, it may be assumed that the corolla is about 40 mm. long. Garcke

(ibid.) suggested that *A. elegans* St. Hil., an older name, may be only varietally distinct from *A. Sellowianum.*

16. This plant is probably a *Bakeridesia,* the carpels being described as "dorso bialatis" (Fl. Bras. 12^3:388). It was not mentioned, however, by Hochreutiner in his synopsis of *Bakeridesia* (Ann. Genève 21:418-421). *A. aurantiacum* Linden is probably a synonym.

17. Synonym: *A. lanatum* Miq., the name under which this species was described in Fl. Bras. (12^3:409).

18. Superficially resembles *A. sylvaticum* but the carpels are 3-ovulate. Rusby described them as "strongly beaked," but they do not appear so in the type specimen.

19. Ulbrich thought this species to be related to *A. reflexum,* but described the petals as spreading, as is evident in the type collection.

20. Leaves discolorous in var. *discolor* K. Schum. In subsp. *discolor* var. *hirsutum* R. E. Fries, the young stems have longish hairs, as in *A. Mouraei,* which may be not specifically distinct from *A. Bedfordianum.* Garcke (Bot. Jahrb. 15:488) thought that *A. montanum* St. Hil. may be an older name for *A. Bedfordianum.*

21. An insufficiently known species. *A. dianthum* Presl may be a synonym. If *Steyermark 55054* was correctly identified as *A. geminiflorum,* the immature carpels are muticous and densely soft-pilose. According to Garcke (ibid. p. 489), this species is scarcely distinguishable from *A. sylvaticum.*

22. **A. peruvianum** (Lam.) Kearney, comb. nov., based on *Sida peruviana* Lam., Encycloped. 1:6 (1783). Synonym: *A. arboreum* of Sweet and later authors, not *Sida arborea* L. f. if the latter was described as having fruits of only 5 carpels and as coming from Africa. (See Cavanilles, Diss. p. 389).

23. Probably at most only a variety of *A. peruvianum.* According to Ulbrich (Bot. Jahrb. 54, Beibl. 117:52), the carpels are 3–5-seeded.

24. Synonym: *A. Lilloi* Hassler (fide A. Krapovickas, personal communication).

25. The styles are slightly enlarged toward apex but the stigmas are capitate and this species certainly does not belong to Schumann's Section *Corynabutilon* (genus *Corynabutilon* Kearney) as Ulbrich thought it did.

26. Synonyms: *A. Flueckigerianum* K. Schum., *A. tacuaremboense* Arech.

27. Synonym: *A. Briquetii* Hochr.

28. Synonym: *A. indicum* var. *hirtum* Griseb. A collection of *A. hirtum* in Peru, by Pavon, was mentioned in Fl. Bras. (12^3:385).

29. Synonyms: *A. purpurascens* K. Schum. but probably not *Sida purpurascens* Link (see Garcke, Bot. Jahrb. 15:489–490). *A. virens* St. Hil. & Naud. may also be a synonym.

30. *A. carneum* was referred by Garcke (Bot. Jahrh. 15:483) to *A. esculentum* St. Hil.

31. Cavanilles' description and illustration of his *Sida mollissima* (Diss. 2:49, t. 14, fig. 1) indicate a plant with very small flowers and triovulate carpels. Garcke (Bot. Jahrb. 15:487, 488) cited as synonyms: *A. calycinum* Presl, *A. sordidum* K. Schum., *A. asiaticum* Griseb. non *Sida asiatica* L., and *Sida cistiflora* L'Hér.

32. *A. molle* (Ortega) Sweet, based on *Sida mollis* Ortega non Rich., is apparently the same as *A. mollissimum* K. Schum. non (Cav.) Sweet, and *A. grandifolium* (Willd.) Sweet.

33. Garcke (ibid. p. 488) referred *A. melanocarpum* St. Hil. & Naud. and *A. pedunculare* Griseb. non H.B.K. to *A. pauciflorum.* Presumably *A. parvifolium* (St. Hil. & Naud.) Hochr. (*A. melanocarpum* var. *parvifolium* St. Hil. & Naud.) and *A. rugulosum* Hochr. are additional synonyms. The corolla of *A. pauciflorum* is always yellow when fresh, although frequently drying pink, fide A. Krapovickas (personal communication). In the related North American *A. Hulseanum* (T. & G.) Torr., the corolla seems to be always white or pink when fresh.

34. Synonym: *A. rivulare* St. Hil. (See Garcke, Bot. Jahrb. 15:484.)

35. Synonym: *A. Johnsonii* Ekman. According to Ingr. A. Krapovickas (personal communication), this very distinct species (*A. Hassleranum*) has an endoglossum under the seeds and in this character represents a transition to the genus *Pseudabutilon,* although otherwise it is very unlike any recognized species of that genus.

36. Synonyms: *A. pseudogiganteum* Steyerm. (and others cited in the key to the North American species, Note 18). Steyermark (Fieldiana 28:362) distinguished *A. pseudogiganteum* from *A. giganteum* as having pubescent seeds, muticous carpels, and corolla without a purple center. The seeds of *A. giganteum* were described in Fl. Bras. (12³:394) as glabrous, but by Fawcett & Rendle (Fl. Jamaica 5³:102) as having "short white hairs tuberculate at base", and this seems generally the case in West Indian and Central American specimens. The carpels of *A. giganteum* are usually cuspidate or short-aristate, but in a specimen from Cuba *(Hioram 1270),* they are exactly as described for *A. pseudogiganteum*; and Urban & Helwig (Repert. Sp. Nov. 24:231) mentioned a specimen from Trinidad with carpels rounded and muticous or submuticous. Finally, the purple center of the coralla seems to be occasionally present in *A. giganteum.* The type and 2 other collections of *A. pseudogiganteum,* cited by Steyermark, came from Venezuela.

37. Very like *A. umbellatum* (L.) Sweet and perhaps only a variety thereof.

38. Probably not distinct, as a species, from *A. benense.* The combination was based upon *Wissadula Balansae* Hassler (1907) which R. E. Fries, in his monograph of *Wissadula* (p. 91) concluded to be probably an *Abutilon.* Hassler's name is untenable, however, there being an older *Wissadula Balansae* Baker f. (1893) which Fries (ibid.) identified as a *Briquetia.*

39. Synonyms: see key to the North American species, Note 31 (Leafl. West. Bot. 7:253).

40. According to Cavanilles, the carpels are 6–11. A specimen from Huanuco, Peru *(Macbride 3493,* Chicago Museum No. 534567), very like *A. umbellatum,* has 11 carpels, these 9 mm. long. Synonyms?: *A. Bridgesii* Baker f., and *A. cymosum* Tr. & Planch. See also *A. Anderssonianum* (first paragraph 84).

41. According to Garcke (Bot. Jahrb. 15:483, 484) the older name *A. divaricatum* Turcz. was based upon the same collection *(Jameson 605)* as was *A. cordatum* Garcke & K. Schum. Garcke confirmed the fact that the carpels

are dispermous, although Turczaninow described them as trispermous in *A. divaricatum*.

42. This name is antedated by *A. anodoides* St. Hil. & Naud. according to Garcke (ibid. p. 485).

43. Synonyms (?): *A. cinereum* Griseb., *A. cornutum* (Humb. & Bonpl.) Sweet, *A. Grevilleanum* (Gill. & Hook.) Walp., *A. mendocinum* Phil., *A. paranthemoides* Griseb.

44. Perhaps only a variety of *A. umbellatum*. See Kearney, Madroño 11:285, 286.

45. Perhaps only a variety of *A. virgatum*.

The Author of Bromus Haenkeanus, a Correction. In a recent article on certain weedy species of *Bromus* (Leafl. West. Bot. 8: 151–154,—1957), I cited Presl as the authority for *B. Haenkeanus,* as has been done also in references by C. F. Smith (A Flora of Santa Barbara, p. 16,—1951), T. H. Kearney (Leafl. West. Bot. 7: 172,—1954), and E. C. Twisselmann (Wasmann Journ. Biol. 14: 203,—1957). Dr. P. A. Munz, however, has called my attention to the fact that Presl's name was *Ceratochloa Haenkeana* (Rel. Haenk. 1: 285,—1830) and that Kunth transferred it to *Bromus* (Enum. Pl. 1: 416,—1833). Hence, for those not recognizing the genus *Ceratochloa,* the correct citation becomes *Bromus Haenkeanus* (Presl) Kunth.—Peter H. Raven.

Lathyrus Cicera Adventive in California. The attractive little Mediterranean annual, *Lathyrus Cicera* L., has been found by Miss Vesta Hesse in the Santa Cruz Mts., San Mateo Co., California. Of its occurrence Miss Hesse writes: "My *No. 1886* was growing among grasses and other weeds along the Skyline Boulevard about 2 miles north of Saratoga Summit at an elevation of about 2300 feet. There was quite a number of plants but they were scattered and inconspicuous. The fresh flowers were reddish." From *L. sphaericus* Retz., which is also an annual with solitary reddish flowers and bifoliolate leaves, *L. Cicera* may be distinguished by the flower-stalks which are longer than the petioles, the very short prolongation of the rhachis, the calyx-lobes which are much longer than the tube, and the twisted style. Since the species is not given by C. L. Hitchcock in his Revision of the North American Species of Lathyrus (Univ. Wash. Publ. Biol. vol. 15, —1952), the plant may be new not only to California but to North America as well.—John Thomas Howell.

NOTABLE PLANTS OF THE WARM SPRINGS INDIAN RESERVATION, OREGON

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AND
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Reed College, Portland, Oregon

For the past few years the second author has been making extensive collections of vascular plants from the lower elevations in and near the Warm Springs Indian Reservation located in Wasco and Jefferson counties, Oregon. These collections have been made in connection with the second author's ethnobotanical studies of the three tribes represented on the reservation. During the course of identification of the plants by the first author, who gratefully acknowledges the assistance of Dr. Arthur Cronquist and Dr. C. Leo Hitchcock, several novelties of distribution were noted which were considered of sufficient interest to warrant a separate report. Judging from specimens deposited in western herbaria, we believe that practically no botanical collections had previously been made on the reservation.

In checking distributional data on the species listed, we have had access to the herbaria of the University of Washington and the University of California and have referred, when possible, to recent monographic treatments of the plants involved and to papers dealing with the floristics of Oregon east of the Cascades. All of the specimens cited are in the second author's herbarium at Reed College, although, where indicated, duplicates have been deposited in the Herbarium of the New York Botanical Garden.

Native Species

Pinus Lambertiana Dougl. A single cone-producing tree has been noted near the junction of the Metolius and Whitewater rivers east of Mount Jefferson, Jefferson County, *No. 1738*. On the western slope of the Cascades this species has been reported as far north as southeastern Clackamas County. In Oregon east of the Cascades the species occurs in scattered stands in the Bend area. The Indian Service reports it from Sawmill Butte in the western central portion of the reservation and has also noted the

existence of a single tree, now dead, on Hehe butte near the Wasco-Jefferson County line.

CORALLORHIZA TRIFIDA Chat. This species has been recorded in Oregon from Wallowa, Hood River, and Union counties. We have collected a flowering specimen in the moist woods near Beaver Creek, Highway 26, near the north reservation boundary, Wasco County, *No. 1339* (NY).

QUERCUS GARRYANA Dougl. This species forms a narrow belt on the eastern edge of the yellow pine forests on the eastern slope of the Cascades near the Columbia Gorge, and has previously been recorded as far south as Tygh Valley. A large stand of this oak occurs on the northern faces of the hills near the northern reservation boundary; it also occurs near Simnasho, a small settlement on the reservation about 20 miles southwest of Tygh Valley, *No. 87*; and it has been noted locally at the mouths of streams tributary to the Deschutes River, such as Oak Creek and Skookum Creek.

LUPINUS ALBICAULIS Dougl. Near Highway 26, approximately 2.5 miles south of the northern reservation boundary, Wasco County, *No. 1458*. As far as we know, this species has been found in Oregon only on the western slopes of the Cascades.

CONVOLVULUS POLYMORPHUS Greene. Although primarily a species of southern Oregon and northern California, this would seem to be well distributed in our region. Peck records this species from Maupin, Wasco County, and we have collected it in the open pine forest near Old Mill, Wasco County, *No. 159*; Tenino Creek valley, Jefferson County, *No. 786*; and pine woods above the junction of the Metolius and Whitewater rivers, Jefferson County, *No. 1449*.

PHACELIA THERMALIS Greene. In Oregon this species has been known only from alkaline flats in Lake, Harney, and Malheur counties. However, we have one plant from the Warm Springs River valley at the bridge on the Warm Springs-Simnasho road, Wasco County, *No. 886*. Whether this species is actually established in the area remains to be determined.

PLAGIOBOTHRYS SCOULERI (H. & A.) Johnst. This species has been recorded from Hood River County in Oregon east of the Cascades. We have noted it in two localities in Wasco County, one a temporary pond at the south end of Schoolie Flat, *No.*

1186, and the other near the old Beaver Creek bridge, Simnasho-Hehe Butte road, *No. 893* (NY).

DOWNINGIA YINA Appleg. var. MAJOR McVaugh. This species is known from Lake and Harney counties east of the Cascades, and has been found along the Columbia River at The Dalles. It is locally abundant in our area, having been collected at Log Springs, *No. 976*; on a sandbar near the Warm Springs River below the Warm Springs-Simnasho road bridge, *No. 1293*; and at the Schoolie Pasture ranger station, *No. 1596*. All of these localities are in Wasco County.

CHAENACTIS NEVII Gray. Previously this species has been collected only in the John Day River valley, but we have found it in Indian Head Canyon, which joins the Warm Springs River valley near the hot springs, Wasco County, *No. 1184* (NY). This is about 40 miles west of the John Day River.

HAPLOPAPPUS CARTHAMOIDES (Hook.) Gray. Specimens showing a range of variation between *H. carthamoides* var. *carthamoides* and var. *Cusickii* Gray have been collected in pine woods by the Wolfard Canyon road, Tenino bench, Jefferson County, *No. 1579* (NY). The former variety has been found at the east end of the Columbia River Gorge in Oregon, and the latter variety is known in Oregon only from the Blue Mountains. While our specimens cannot be assigned exclusively to either variety, the locality in which they were collected is clearly a new one for the species.

ERIOPHYLLUM LANATUM (Pursh) Forbes var. ACHILLAEOIDES (DC.) Jeps. In Oregon, this variety of *E. lanatum* has been recorded as far north as Lane County. We have collected it in successive years at the Hehe celebration ground, Wasco County, *No. 1283, 1469* (NY).

MADIA SATIVA Mol. Although previously recorded in Oregon only from the western portion of the state, we have found it along the road north of Simnasho, Wasco County, *No. 1562* (NY).

INTRODUCED SPECIES

AGROPYRON DESERTORUM (Fisch.) Schult. Beside Highway 26, east side of Deschutes River, 0.5 mile south of bridge, Jefferson County, *No. 1253.*

POA BULBOSA L. Valley of Shitike Creek, west of Warm Springs agency area, *No. 701.*

DIANTHUS ARMERIA L. Hehe celebration ground by the Warm Springs River, Wasco County, *No. 1624.*

LYCHNIS CORONARIA (L.) Desr. About 3 miles below the head of the Metolius River, Jefferson County, *No. 135.*

RANUNCULUS TESTICULATUS Crantz. This interesting little plant has been previously recorded in Oregon from Condon in Gilliam County and from Wheeler County. Our plants were collected near a cattle trough at Miller Flat, south of Highway 26, southern Wasco County, *No. 1679* (NY).

TRIBULUS TERRESTRIS L. First recorded in 1938, this pest has spread rapidly in Oregon. It is occasionally encountered on the reservation, especially on open, packed ground near human habitation, *e.g., No. 845,* near the stores at the Warm Springs agency area.

MYOSOTIS DISCOLOR Pers. Although this species occurs in scattered localities in western Oregon, it has been recorded east of the Cascades only in Wallowa County. We have it from open pine woods at the Hehe celebration ground, Wasco County, *No. 898.*

CENTAUREA DIFFUSA Lam. Creek bottom on Tygh Ridge, Wasco County, *No. 1115* (NY); in this locality plants with whitish flowers and plants with lavender flowers grew together.

HYPOCHAERIS RADICATA L. While this weed is well established in western Oregon, it is uncommon east of the Cascades. Our specimens are from the Hehe celebration ground, Wasco County, *No. 1631* (NY).

A REAPPRAISAL OF CAREX FLACCIFOLIA

BY JOHN THOMAS HOWELL

Even as *Carex flaccifolia* was being named among "additional species" in "A monograph of the California species of the genus Carex" by Mackenzie (1922a, p. 92), it seemed a questionable proposal based on a specimen "said to have been collected on dry plains in southwestern California" by George B. Grant. At the time it was described, it was referable presumably to the section *Laxiflorae,* since it was numbered **76a** (to follow **76. C. Hendersonii** Bailey on p. 60), there being nothing in the inade-

quately brief diagnosis to indicate that its real affinity was with the following species, **77. C. Whitneyi** Olney. Although the matter of its relationship to *C. Whitneyi* has been clearly stated several times since (Mackenzie, 1922b, 1923a, 1923b, 1931-1935), *C. flaccifolia* has remained a doubtful entity, known from only the single collection that was reputedly found in a region where such a plant could probably not grow. It now appears that *C. flaccifolia* is not only referable to *C. Whitneyi* in the most restricted sense of that species but that its type may have come from Yosemite Valley, the type-locality of *C. Whitneyi.*

In my attempt to gain a proper estimate of *C. flaccifolia* with respect to *C. Whitneyi,* I made an analytic comparison of Mackenzie's full diagnoses in the North American Flora (1935, pp. 274, 275) and compared each point of difference with the type of *C. flaccifolia* (loaned to me from the U.S. National Herbarium by J. R. Swallen), with the type of *C. Whitneyi* (loaned to me together with other collections from the Herbarium of Brown University by G. L. Church), and with a set of 34 specimens of *Carex* sect. *Longicaules* of the western United States in the California Academy of Sciences Herbarium. The result of this study disclosed that whereas Mackenzie's concept of *C. Whitneyi* corresponded to most of the specimens in the series, his delineation of *C. flaccifolia* agreed in even minute details with a few specimens from the central Sierra Nevada in California, notably with collections made in Yosemite Valley. In these specimens and also in two collections made by D. D. Keck in Tuolumne County at Mather *(No. 1229, 5547),* the following critical characters of *C. flaccifolia* were met: leaf-blades generally flat, leaf-sheaths white-hyaline ventrally, scales of staminate flowers oblong-obovate and pale yellowish or whitish, pistillate spikelets 8–10 mm. wide, scales of pistillate flowers spreading or widely ascending and usually not appressed, perigynia ovoid, 4–4.5 mm. long and 2–2.3 mm. wide, rather abruptly contracted into the beak, the beak 0.5–1 mm. long, more or less bidentulate.[1]

Since morphologic evidence indicates that *C. flaccifolia* is not distinguishable from that form of *C. Whitneyi* that grows in the Transition Zone forest on the western slope of the central Sierra

[1] Mackenzie gives the length of perigynia as 3.5–4.25 mm. for *C. flaccifolia.* Of 7 perigynia that I measured on the type, 5 were a little over 4 mm. long and 2 were about 4.5 mm. long. Originally Mackenzie described the perigynium-beak of *C. flaccifolia* as 0.5 mm. long (Erythea 8: 92) but later changed this to 0.25 mm. (N. Amer. Fl. 18: 274). I would give the length of the perigynium-beaks of the type as generally about 0.5 mm. and I measured one beak about 1 mm. long.

Nevada, it would seem quite certain that George B. Grant mislabeled the type of *C. flaccifolia*. Grant, whose home was in Pasadena, is best remembered for his extensive collections of southern California plants; but, to determine whether he did field work in the Sierra Nevada, I turned to Adele Lewis Grant's highly documented monograph of the genus *Mimulus* (Mo. Bot. Gard. Ann. 11: 99–388) in an attempt to locate some of G. B. Grant's collecting areas farther afield. From this I learned that from July 4 to 12, 1901, G. B. Grant had collected in Yosemite Valley (cf. data under *Mimulus moschatus,* pp. 226, 228). To me the inference is indubitable—that the type of *C. flaccifolia* was collected in Yosemite Valley (or vicinity), and later, being mistaken for *C. triquetra,* was given a label to fit the provenance of that species. As I had scrutinized the Grant specimen I had felt that its more slender culms, more flaccid foliage, and more loosely spreading pistillate scales indicated a *Whitneyi* collection that was more advanced in age than those I was studying from the Yosemite. Since those collections were made in May and June, the July dates of Grant's Yosemite visit corroborated my feeling and could account in part for morphologic details that impressed Mackenzie.

Carex Whitneyi Olney was based on seven collections from the Sierra Nevada (Olney, 1868, p. 394), and it is this set of material, as noted above, which I have been privileged to examine from the Olney Herbarium at Brown University. In this series it is obvious that Olney regarded Brewer's collection from Yosemite Valley, *No. 1639,* as the type, since it is the only collection Olney labeled "n. s." Moreover it is the collection first cited by Olney (l.c.) and is the one accepted by Mackenzie as the type (Erythea 8: 61). From this it seems apparent that the name *C. Whitneyi* is to be applied to a relatively rare plant with a limited Sierran distribution and that *C. flaccifolia* is a synonym.

Although Mackenzie accepted the typification of *C. Whitneyi* as established by Olney, the plant he treated as *C. Whitneyi* is one that grows at higher elevations and is distributed from southern Oregon southward through the Sierra Nevada. That plant, now without a name,[2] may be known as **Carex Jepsonii**

[2] I have not been able to ascertain the correct identity of *C. pilosiuscula* Boeck. (1882), given as a synonym of *C. Whitneyi* by Kükenthal (1909, p. 581) and Mackenzie. The type locality given by Mackenzie (1922a) as "salt plains of the Rocky Mts." would seem to indicate that Boeckeler's species is the same as *C. Whitneyi* sensu Mackenzie. Boeckeler's name, however, is a later homonyn of *C. pilosiuscula* Gobi (1876) and hence is not available for the plant herein named as new.

J. T. Howell, spec. nov.[3] It may be appropriately typified by *Jepson No. 4477* in the Herbarium of the New York Botanical Garden, the specimen selected by Mackenzie to illustrate "*C. Whitneyi*" in Plate 321 of the North American Cariceae. In that work *C. Whitneyi* is depicted by Plate 320 (entitled *C. flaccifolia*). The illustration of *C. Whitneyi* in Erythea vol. 8 (fig. 31) is based on *Jepson 4348* from Yosemite Valley and hence is correctly named. Fig. 783 in Abrams Illustrated Flora (vol. 1, p. 324) is based on the collection of Bolander and Keller made in 1872 that is in the New York Botanical Garden. This collection, loaned to me by D. D. Keck, is *C. Jepsonii*.

The following synopsis outlines the pertinent synonymy and lists collections on which the study has been made. Collections are in Herb. Calif. Acad. Sci. (CAS) unless otherwise indicated.

CAREX WHITNEYI Olney, Proc. Amer. Acad. 7:394 (1868). *C. flaccifolia* Mkze., Erythea 8:92 (1922); N. Amer. Cariceae Plate 320 (1940).

CALIFORNIA. MARIPOSA COUNTY: Yosemite Valley, 4000 ft., June 18, 1863, *Brewer 1639*, "growing loosely in a tuft on dry granite soil . . ., common" (BRU, type; UC); Yosemite Valley, May 24, 1892, *Congdon* (UC); Yosemite Valley, June 24, 1911, *Jepson 4348* (JEPS, NY); east end of Yosemite Valley between Happy Isles and Mirror Lake, June 2, 1940, *Howell 15578* (CAS); Hogan Mt., June 23, 1893, *Congdon* (UC). TUOLUMNE COUNTY: frequent in dry places in shade of *Pinus ponderosa* and *Quercus Kelloggii*, Mather, 4600 ft., June 8, 1931, *Keck 1229* (CAS); dry meadow borders, Mather, May 29 and June 3, 1946, *Keck 5547* (CAS).

CAREX JEPSONII J. T. Howell. *C. Whitneyi* Mkze. in large part, N. Amer. Fl. 18: 274 (1935); N. Amer. Cariceae Plate 321 (1940). ? *C. pilosiuscula* Boeck., Flora 65: 61 (1882), not Gobi (1876).

OREGON. Alpine pumice slopes near Vitae Falls, Crater Lake, 6000 ft., Klamath Co., *J. W. Thompson 12227;* Crane Mt. near Lakeview, Lake Co., *J. W. Thompson 13208.*

NEVADA. Incline, Washoe Co., *L. S. Smith in 1928.*

CALIFORNIA. California, *Bolander & Keller in 1872* (BRU, CAS, NY); in fir

[3] CAREX JEPSONII J. T. Howell, spec. nov. (LONGICAULES). Dense caespitosa; culmis 2.5–6 dm. altis, brunnescentibus basi; laminis foliorum pubescentibus supra et infra, 2–3 mm. latis, planis vel plerumque revolutis margine, vaginis albescentibus vel cinnamomeis ventro; spiculis 3 vel 4, terminali staminea lineari, 0.5–2 cm. longa, squamis stamineis oblongo-ovatis plus minusve brunneo-tinctis, spiculis lateralibus femineis oblongis vel lineari-oblongis, 1–2.5 cm. longis, 5–7 mm. latis, squamis femineis late ovatis, appresso-ascendentibus, 3-nervatis, viridescentibus praeter castaneo-brunnescentem marginem; perigyniis valde ascendentibus elliptico-ovoideis vel -obovoideis, triangularibus, 3.75–4.5 mm. longis, 1.5–2 mm. latis, conspicue nervatis, glabris, pallide viridibus, supra sensim attenuatis in rostrum brevem crassum, rostro 0.25–0.5 mm. longo, bidentulato, paulum hyalino, perigyniis basi cuneatis vel substipiformibus; stigmatibus 3, stylo deciduo; achaeniis obovatis, 3–3.5 mm. longis, brunneis, breviter rostratis, substipitatis basi.

Type in Herb. N. Y. Bot. Gard., *Jepson 4477*, collected July 20, 1911, in Tuolumne Meadows, 8800 ft. alt., Tuolumne County, California.

Carex Jepsonii is closely related to *C. Whitneyi* Olney from which it may be differentiated by its narrow leaves, narrower pistillate spikelets with appressed-ascending scales, and smaller perigynia with shorter, stouter beaks.

and pine woods, Benton Meadow area, Warner Mts., 6800 ft., Modoc Co., *Alexander & Kellogg 5018;* Medicine Lake, Siskiyou Co., *Eastwood 10941A;* Mt. Shasta, 5500 ft., Siskiyou Co., *Cooke 11161;* Hat Lake, Mt. Lassen, 6450 ft., Shasta Co., *Leschke in 1954;* meadow at Drakesbad, Plumas Co., *Mrs. H. C. Cantelow 2278;* Johnsville, 5200 ft., Plumas Co., *Howell 27567;* west side of Donner Pass near Norden, 7000 ft., Nevada Co., *Howell 18320;* open pine forest, Chambers Lodge, Lake Tahoe, 6300 ft., Placer Co., *L. S. Rose 44051;* Silver Fork of American River, 4700 ft., Eldorado Co., *Howell 18888;* Luther Pass, Alpine Co., *Eastwood & Howell 8370;* Tuolumne Meadows, 8800 ft., Tuolumne Co., *Jepson 4477* (NY, type; JEPS); Dog Lake above Tuolumne Meadows, 9240 ft., Tuolumne Co., *L. S. Rose 34430*; east side of Ostrander Rocks, Mariposa Co., *Hoover 3750*; Mammoth Lakes region, Mono Co., *L. S. Rose 35398, Howell 14424*; Agnew Pass Trail, Madera Co., *Howell 16566;* ridge north of Colby Meadows, 11,000 ft., Fresno Co., *Raven 4365;* Chagoopa Plateau, Tulare Co., *Howell 17564;* Long Lake, Rock Creek Lake Basin, 10,700 ft., Inyo Co., *Peirson 9415*. Possibly also a sterile specimen: South Fork of Salmon River near Big Flat, 5000 ft., Siskiyou Co., *Howell 13322,* collected July 22, 1937.

References

Kukenthal, G.

1909. Cyperaceae-Caricoideae in Engler, Das Pflanzenreich IV. 20 (Heft 38), 1–824.

Mackenzie, K. K.

1922a (Jan.). A monograph of the California species of the genus Carex. Erythea 8: 1–95.

1922b (March). *Carex* in W. L. Jepson, A Flora of California, vol. 1, pp. 207–242.

1923a (May). *Carex* in L. Abrams, An Illustrated Flora of the Pacific States, vol. 1, pp. 282–344.

1923b (Dec.). *Carex* in W. L. Jepson, A Manual of the Flowering Plants of California, pp. 158–193.

1931–1935. North American Flora, vol. 18, parts 1–7.

1940. North American Cariceae. 2 vols.

Olney, S. T.

1868. Carices novae a Stephen T. Olney, A. M., descriptae, 1868. Proc. Amer. Acad. 7: 393–396.

Meadow Salsify in San Luis Obispo County, California. On May 17, 1957, I collected several specimens of *Tragopogon pratensis* L. one-fourth mile north of the west entrance to California State Polytechnic College on State Highway 1, San Luis Obispo County, California, my *No. 169*. Herbarium specimens are deposited in the college herbarium. This is apparently a new station in California for this species.—Winton H. Frey, Jr., San Luis Obispo.

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LEAFLETS *of* WESTERN BOTANY

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JOHN THOMAS HOWELL

A TENTATIVE KEY TO THE SOUTH AMERICAN SPECIES OF PAVONIA, CAV.

BY THOMAS H. KEARNEY (†)

Asterochlaena Garcke *(Pseudopavonia* Hassler) and *Peltaea* (Presl) Standley *(Peltobractea* Rusby) are included but *Lopimia* Mart. and *Triplochlamys* Ulbr. are excluded from the genus *Pavonia* as here understood. Juxtaposition of species does not necessarily indicate close relationship, the key being an artificial one. As far as practicable, the characterizations are based upon examination of herbarium specimens, but in many cases these were not available and published descriptions and (or) photographs of types were the only source of information, hence the word "tentative" in the title. Species not known from south of Panama are excluded. The notes will be found at the end of the key.

1. Involucel-bractlets (7–12) stipe-like, more or less rigid, expanded abruptly at apex into a thickish, often reflexed, usually more or less peltate bladelet. Flowers more or less closely subtended by large, foliaceous bracts. Section PELTAEA (2).
1. Involucel-bractlets sometimes spatulate, but not stipe-like and expanded at apex as above (6).
2. Petals (20) 25–50 mm. long, red or white with a purple basal spot; carpels more or less conspicuously transversely veiny, more or less pubescent (3).
2. Petals not more (?), usually less than 25 mm. long, yellow (or pink?); carpels obscurely if at all veiny (4).
3. Stems hirsute and (or) tomentose; leaves suborbicular, ovate, or ovate-oblong, obtuse or acutish; calyx often more than 9 mm. long. Petals usually 30 mm. or longer. Bolivia, Brazil, Paraguay ....*P. speciosa* H.B.K. ssp. *polymorpha* (St. Hil.) Guerke. Note 1
3. Stems minutely stellate-pilose or glabrescent; leaves oblong-elliptic, elliptic, or elliptic-lanceolate, very acute or subacuminate; calyx 4–9 mm. long. Surinam .....*P. Julianae* Uitt. Note 2
4. Leaves 7–9-nerved; more or less tomentose; carpels glabrous. Costa Rica to Brazil and Paraguay .....*P. sessiliflora* H.B.K. Note 3
4. Leaves 3–5-nerved, sparsely rough-pubescent or puberulent; carpels pubescent (5).
5. Blades mostly lanceolate and 3-nerved. Colombia, Brazil, Peru, Bolivia ....*P. Riedelii* Guerke. Note 4
5. Blades normally ovate or lance-ovate and 5-nerved. Panama and Venezuela .....*P. Preslii* Standl. Note 5

(†) This is the third paper dealing with the taxonomy of *Malvaceae* to be published in this journal with aid from the T. H. Kearney Memorial Fund of the California Academy of of Sciences.—J. T. HOWELL.

Leaflets of Western Botany, Vol. VIII, pp. 225–248, May 15, 1958.

6. Calyx more or less cylindric, the lobes only 1/5–1/3 of its length. Bractlets 8–14; corolla tubular, the petals erect, red, 25 mm. or longer; androecium (in *P. Glazioviana?*) more or less exserted. Section MALVAVISCOIDES. Note 6. (7).
6. Calyx campanulate or cup-shaped, the lobes more than 1/3 of its length. Note 7. (11).
7. Bractlets 1–2 cm. long, shorter than the calyx; petals 35–45 mm. long. Leaves ovate or suborbicular (8).
7. Bractlets 3–4 cm. long, longer than the calyx; petals 25–30 mm. long (9).
8. Involucel of 8–10 linear-subulate bractlets. Brazil (Minas Geraes, etc.) ..... *P. malvaviscoides* A. Juss.
8. Involucel of 11–14 subulate-filiform bractlets. Brazil (Minas Geraes, Rio de Janeiro) ..... *P. montana* Garcke. Note 8
9. Bractlets 12–14; leaves orbicular or suborbicular, distinctly petiolate. Brazil (Bahia) ..... *P. Glazioviana* Guerke
9. Bractlets fewer than 12; leaves otherwise (10).
10. Leaves short-petiolate, oblong-lanceolate; bractlets 8. Brazil (Minas Geraes) ..... *P. erythrolema* Guerke
10. Leaves subsessile, elliptic or ovate; bractlets about 10. Petals purple, about 25 mm. long; stamens, anthers, and styles dark purple; fruit unknown. Brazil (Bahia) ..... *P. melanostyla* Ulbr.
11. Leaves 1-nerved, pinnately veined, elliptic, oblong-elliptic, or lanceolate; bractlets 5–9; petals 14–20 mm. long; carpels muticous or mucronate. Section GOETHEOIDES. Note 9. (12).
11. Leaves 3- or more-nerved (Note 10), or the bractlets more numerous, or the petals longer than 20 mm., or the carpels cuspidate or aristate (15).
12. Stipules 6–8 mm. long; lower leaves 2–5 cm. long; androecium nearly twice as long as the petals. Bractlets 5 or 6. Brazil (Rio de Janeiro) ..... *P. semiserrata* (Schrad.) Guerke
12. Stipules 10–25 mm. long; lower leaves 7–20 cm. long; androecium shorter to slightly longer than the petals (13).
13. Bractlets 5 or 6, ovate-lanceolate; calyx nearly or quite equaling the involucel. Brazil (Minas Geraes, Rio de Janeiro) ... *P. alnifolia* A. Juss.
13. Bractlets 7–10; calyx 2–2.5 times shorter than the involucel (14).
14. Stipules 10–15 mm. long; peduncles 9–11 cm. long; bractlets narrowly linear. Brazil (Bahia) ..... *P. calyculosa* St. Hil. & Naud. Note 11
14. Stipules 20–25 mm. long; peduncles 20–30 cm. long; bractlets elliptic or oblanceolate. Brazil (Bahia) ..... *P. longipedunculata* Guerke
15. Carpels aristate or cuspidate, with 1 or 3, usually retrorsely hispid or retrorsely pilose, apical awns or cusps. Section TYPHALAEA (16).
15. Carpels muticous or merely mucronate (Note 12). Section EUPAVONIA, including *Asterochlaena* (43).
16. Apical awn or cusp single (17).
16. Apical awns or cusps 3 (20).
17. Cusp much less than 4 mm. long. Leaves up to 5 cm. long, often shallowly 3-lobed; carpels pubescent or puberulent (18).

17. Cusp or awn 4 mm. or longer. Bractlets 9 or more, much longer than the calyx (19).

18. Carpels with concave, wing-like margins; petals yellow, spotless (?), about 25 mm. long; bractlets 6 or 7 in number, very narrow, 15–18 mm. long, 3 times as long as the calyx. Paraguay.....
.....*P. apiculata* R. E. Fries. Note 13

18. Carpels not wing-margined; petals purple or blood-red, 10–12 mm. long; bractlets 12–18 in number, twice as long as the calyx. Leaves discolorous. Brazil (Bahia) .....*P. Philippi* Ulbr. Note 14

19. Leaves elliptic-oblong, much longer than wide, not cordate, 1-nerved; stems not glandular; bractlets 9 or 10, subulate; petals 10–12 mm. long; androecium not exserted; awn usually much longer than the body of the carpel, mostly 8–10 mm. long, retrorsely hispid. Brazil
.....*P. monatherica* Casar. Note 15

19. Leaves suborbicular, cordate, several-nerved; stems glandular-tomentose and hirsute; bractlets about 22, filiform; petals 25–30 mm. long; androecium 3–4 times as long as the petals; awn somewhat shorter than the body of the winged carpel, about 4 mm. long. Brazil (Bahia) .....*P. Luetzelburgii* Ulbr. Note 16

20. Leaves deeply, palmately 5–7-lobed, suborbicular, velutinous on both surfaces, the lobes obtuse, with undulate and more or less incurved margins, the basal lobes overlapping. Bractlets 9–12, linear-subulate; petals yellow, 20–25 mm. long; awns conic, much shorter than the carpel-body, the lateral awns borne far below the apex of the carpel and projecting between the calyx-lobes. Brazil (Bahia) .....
.....*P. varians* Moric.

20. Leaves not lobed, or shallowly angulate-lobed, or deeply hastate-cordate (21).

21. Bractlets 5–7 or (in *P. fruticosa, P. Spinifex,* and (?) *P. sepium)* sometimes 8, less than twice the length of the calyx. Leaves crenate-dentate or serrate (22).

21. Bractlets rarely fewer than 9 (28).

22. Petals 2–4 cm. long (sometimes shorter in *P. Spinifex?),* yellow; leaves subcordate to rounded at base, broadly ovate to ovate-lanceolate; carpel-awns variable, sometimes short and stout and the lateral ones strongly divergent. Flowers solitary, sometimes crowded apically; bractlets nearly distinct, linear-lanceolate or narrowly spatulate (23).

22. Petals seldom more than 2 cm. long; leaves cuneate to rounded (exceptionally subcordate) at base; carpel-awns usually elongate, slender, and the lateral ones erect or ascending (24).

23. Herbage inconspicuously pubescent or glabrescent; leaves slightly discolorous to nearly concolorous, rather finely dentate; androecium and styles usually longer than the corolla. Peru; North America.....
.....*P. Spinifex* (L.) Cav. Note 17

23. Herbage more or less velutinous; leaves distinctly discolorous, coarsely (often doubly) dentate; androecium and styles usually shorter than the corolla. South-central Brazil to Peru, eastern Bolivia and northern Argentina .....*P. communis* St. Hil. Note 18

24. Bractlets ovate- or oblong-lanceolate, commonly united at least ¼ of their length, the lobes 2–4 mm. wide at base; petals normally white or whitish, 10–13 mm. long (25).

24. Bractlets (in *P. urticifolia?*) linear-lanceolate or subspatulate, united only at base; petals yellow, 10–20 (25) mm. long. Note 19. (26).

25. Flowers mostly in terminal, capitate or corymbiform clusters; leaves oblong-elliptic or obovate, cuneate to rounded (exceptionally subcordate) and usually nearly symmetric at base. West Indies and Mexico to Peru, Brazil, and Paraguay ..... *P. fruticosa* (Mill.) Fawc. & Rendl. Note 20

25. Flowers in loosely corymbiform or racemose clusters of 3 to 6, these borne on very long, scape-like peduncles; leaves broadly oval to elliptic-lanceolate, rounded and inequilateral at base. Peru, Bolivia (and Ecuador?) ..... *P. leucantha* Garcke

26. Calyx 8–10 mm. long, longer than the involucel, cleft nearly to the base, sparsely hispidulous; carpels dorsally pilose with long, crisp hairs, the awns obscurely retrorse-pilosulous. Brazil ..... *P. flavispana* Miq.

26. Calyx not more, usually less than 8 mm. long, seldom longer than the involucel; carpel-awns conspicuously retrorse-hispid (27).

27. Flowers mostly solitary in the axils, long-pedunculate; calyx seldom more than 5 mm. long, usually shorter than the involucel; carpels often hispid on the dorsal keel and the margins as well as the awns, otherwise glabrous. Leaves oblong-lanceolate to oval or ovate, thin, conspicuously dentate or serrate. Colombia, Ecuador, Bolivia (?), Paraguay, Brazil, Uruguay, Argentina. ..... *P. sepium* St. Hil. Note 21.

27. Flowers more or less clustered in terminal, corymbiform inflorescences; calyx 6–8 mm. long, equaling the involucel; carpels covered dorsally with bristles. Uruguay ..... *P. urticifolia* Arech. Note 22

28. Leaves 1–2 cm. long, about ½ as wide, ovate to ovate-lanceolate. Flowers solitary in the axils, on peduncles much longer than the leaves; bractlets 9–15, 2–3 times the length of the calyx; petals 18–20 mm. long, greenish-yellow; carpels transverse-rugose dorsally, the awns short and stout, the lateral ones divergent. Brazil, Paraguay ..... *P. microphylla* Casar.

28. Leaves (the larger ones) more than 2 cm. long and (except in *P. cancellata, P. cochensis,* and *P. humifusa)* usually less than ½ as wide (29).

29. Involucel shorter than to equaling the calyx. Leaves crenate or crenate-serrate; bractlets united well above the base; petals white or whitish (30).

29. Involucel longer than the calyx (31).

30. Flowers solitary or geminate, short-pedunculate; leaves oblong-lanceolate, about 3 times as long as wide; petal length unknown; carpel awns about as long as the body. Colombia..... *P. Goudotiana* Tr. & Planch.

30. Flowers in clusters of 3–6, these loosely racemose or corymbose on long, scape-like peduncles; leaves broadly oval to elliptic-lanceolate; petals 10–12 mm. long; carpel-awns ½ as long as (or sometimes nearly equal-

ing?) the narrowly obovoid-trigonous body. Peru, Bolivia, (and Ecuador?) ..... *P. leucantha* Garcke. Note 23

31. Stems prostrate; leaves (except sometimes in *P. humifusa)* not more than 6.5 cm. long; awns or cusps shorter than the body of the carpel, usually stout. Flowers solitary, on short or somewhat elongate peduncles; bractlets numerous, very narrow, conspicuously hirsute or hispid, longer than the calyx (32).

31. Stems mostly erect or ascending; leaves (except sometimes in *P. pseudotyphalaea)* often more than 6.5 cm. long; awns usually elongate (34).

32. Leaves ovate, not (?) lobed, (up to?) 3 cm. long and nearly as wide; bractlets about 10 mm. long. Herbage velutinous; corolla and stamens unknown; carpels shortly 3-aristate, minutely puberulent. Venezuela (Coche Island) ..... *P. cochensis* J. R. Johnst. Note 24

32. Leaves more or less deltoid and often angulate-lobed; bractlets mostly more than 10 mm. long. Stamen-column antheriferous to the base; petals yellow; carpels rugose (33).

33. Petals 18–25 mm. long, with a dark purple basal spot; stems usually more or less hirsute with long, simple hairs, often also glandular-pubescent; leaves subdeltoid, often trilobate, deeply cordate or hastate-cordate, up to 5 (6) cm. long, about as wide as long; bractlets 9–15 mm. long, distinct; androecium 10 mm. long; carpels with sharp edges or narrowly winged, shortly 3-aristate to merely 3-mucronate. Colombia, Venezuela, Guiana, Brazil, Bolivia .... *P. cancellata* (L. f.) Cav. Note 25

33. Petals 30–40 mm. long, without (?) basal spot; stems velutinous, usually without long, simple hairs; leaves deltoid, more or less 3–5-lobed, up to 8 cm. long, usually wider than long; bractlets 15–20 mm. long; androecium 20–25 mm. long; carpels not winged, 3-mucronate or 3-cuspidate. Brazil (Bahia, Rio de Janeiro). *P. humifusa* A. Juss. Note 26

34. Bractlets distinct or united not more than ¼ way from base (35).

34. Bractlets united well above (usually at least ⅓ way from) the base. Flowers mostly in terminal, corymbiform or subcapitate inflorescences (37).

35. Stems hirsutulous or puberulent with short, whitish, mostly forked or stellate hairs; flowers mostly in short, more or less dense, corymbiform or subcapitate terminal clusters. Involucel of usually 8–10 linear or narrowly lanceolate bractlets, these united toward base, 0.5–2 mm. wide, 3-nerved; petals 10–15 mm. long, pink or white. West Indies and Mexico to Colombia, Ecuador, and Brazil .... *P. rosea* Schlecht. Note 27.

35. Stems copiously hirsute or hispid with yellowish or fulvous hairs; flowers solitary, binate, or in clusters of 3 or 4. Leaves oblong-elliptic or elliptic-lanceolate (exceptionally slightly obovate); petals white (36).

36. Stipules 8–10 mm. long; flowers solitary or in corymbose clusters of 3 or 4; bractlets 10, about 1.5 times as long as the calyx; petals 12–13 mm. long; fruit unknown. Colombia ... *P. pseudotyphalaea* Planch. & Lind.

36. Stipules 3–5 mm. long; flowers mostly solitary or binate; bractlets 11 or more, 2–4 times as long as the calyx; petals about 10 mm. long; carpel-

awns subequal, spreading, longer than the body. Colombia, Brazil, Peru, Costa Rica, Panama .....*P. oxyphyllaria* Donn. Smith. Note 28

37. Leaves (the largest) less than 15 cm. long. Petals about as long as the involucel (38).

37. Leaves (except sometimes in *P. intermedia* and *P. umbrosa)* 15 cm. long or longer (40).

38. Peduncle (scape) 3–4 cm. long; leaves glabrescent above, elliptic; calyx glabrous, cylindric, 3 mm. long; awns about ⅓ as long as the carpel-body, subequal. Bractlets about 10, united nearly ½ their length; petals pink, 8–9 mm. long. Peru .....*P. parva* Ulbr. Note 29

38. Peduncle 5–20 cm. long; leaves more or less pubescent above; calyx pubescent or puberulent, campanulate (in *P. silvatica?),* more than 3 mm. long; awns about ½ as long as the carpel-body (39).

39. Leaves obovate or oblanceolate, sparsely stellate-pilose on both surfaces; petals white, 6–7 mm. long. Ecuador .....*P. silvatica* Diels. Note 30

39. Leaves oblong-elliptic or subrhombic, hirsute on both surfaces with mostly simple hairs; petals (color unknown) 8–10 mm. long. Floral bracts 3-parted; bractlets 9–10, united about ½ way. Colombia, Peru .....*P. peruviana* Guerke

40. Carpel-awns (at least the middle one) longer than the body. Inflorescences corymbiform, several- to many-flowered; involucel 9–10-lobed (41).

40. Carpel-awns not longer than the body. Leaves cuneate at base, coarsely and irregularly dentate, 15–20 mm. long, much longer than wide; involucel much longer than the calyx, 9–12-lobed (42).

41. Leaves elliptic, oblong-elliptic, or lanceolate, 2–4 times as long as wide, more or less acuminate at apex, coarsely and irregularly dentate, appressed-hispidulous on both surfaces with rigid, simple or stellate hairs; involucel very shortly stellate-pubescent; petals apparently less than 10 mm. long, whitish; middle awn 2.5–3 times as long as the carpel-body, much longer than the lateral awns, the carpel-body carinate, smooth-sided, glabrous. Brazil .....*P. intermedia* St. Hil.

41. Leaves narrowly oblanceolate, about 4 times as long as wide, somewhat abruptly caudate-acuminate at apex, serrate, glabrescent on both surfaces; involucel glabrate; petals about 10 mm. long; mature fruit unknown. Bolivia .....*P. umbrosa* R. E. Fries

42. Middle awn of the carpel about equaling the body; leaves (in the type) cuneate-obovate; involucel much longer than the very short calyx; petals pink. Southern Brazil and (?) Trinidad.....
.....*P. castaneaefolia* St. Hil. & Naud.

42. Middle awn shorter than the carpel-body; leaves cuneate-lanceolate, about ⅓ as wide as long, appressed-hispidulous on both surfaces (then glabrescent?); involucel about 3 times as long as the calyx; petals white, 12–13 mm. long. Carpels elongate, narrow, carinate, rugose-veiny, glabrous. Brazil, Peru..*P. Warmingiana* Guerke. Note 31

43. Involucel of 4 bractlets, these distinct or nearly so, broadly ovate, 13–16 mm. long and nearly as wide at the cordate base. Herbage densely

pubescent; leaves ovate, cordate or subcordate, irregularly dentate (44).

43. Involucel, except rarely in *P. Hassleriana* and *P. lanata,* of more than 4 bractlets, these usually much narrower and not cordate (45).

44. Herbage velutinous with short, stellate hairs; leaves 1.5–2 times as long as wide; calyx 8–10 mm. long, the lobes deltoid-lanceolate; petals about 30 mm. long, the color unknown; carpels 3.5–4 mm. long, obovoid-trigonous, reticulate-veiny and nodulose-tuberculate. Brazil (Matto Grosso, Minas Geraes) and Bolivia.....*P. Garckeana* Guerke

44. Herbage hirsute-tomentose with rather long, few-armed hairs; leaves little longer than wide; calyx 15–20 mm. long, the lobes oblong-ovate; petals about 45 mm. long, red; carpels 8 mm. long, oblong in outline, slightly curved, not evidently veined, smooth. Brazil (Maranhão, Pará) .....*P. Ulbrichiana* Kearney

45. Bractlets normally 5, exceptionally 6 or 7. Petals white, pink, purplish, or red, often with a dark purple basal spot. Note 32. (46).

45. Bractlets normally 6 or more (77).

46. Leaves (except occasionally or normally in *P. belophylla, P. hastata, P. lanata, P. nana, P. pulchra, P. rhodantha,* and perhaps *P. consobrina)* relatively narrow, mostly less than ½ as wide as long, sagittate or hastate (exceptionally truncate or subcordate) at base, not otherwise lobed. Note 33. (47).

46. Leaves (except in *P. Schrankii)* relatively broad, mostly ½ as wide as long or longer, mostly cordate or subcordate at base, sometimes lobed above the base (66).

47. Calyx-lobes (in *P. Hoehnei?, P. lanata?)* 3-nerved; involucel-bractlets (except in *P. rhodantha* and perhaps also *P. Hoehnei, P. lanata,* and *P. nana)* commonly 5-nerved (48).

47. Calyx-lobes (except occasionally in *P. hastata?)* more or less distinctly 5-nerved; bractlets 3–5-nerved. Note 34. (55).

48. Carpels (in *P. lanata?)* smooth, obscurely to conspicuously (but not prominently) veined or marbled. Leaves more or less discolorous, ovate- to oblong-lanceolate, ⅓–½ as wide as long, deeply and narrowly sagittate or subhastate, often reflexed; flowers solitary in the axils; involucel slightly shorter than the calyx (49).

48. Carpels prominently reticulate or tuberculate (50).

49. Herbage velutinous or subhirsute with rather long hairs; leaves acutish, denticulate, up to 10 cm. long; involucel calyx-like, of 5 (exceptionally 6) bractlets, these united below (often to the middle), the lobes ovate or obovate, obtuse, 3–6 mm. wide at base; petals 20–25 mm. long. Carpels strongly carinate, pubescent or puberulent. Brazil..... .....*P. sagittata* A. Juss. Note 35

49. Herbage densely but loosely white-pubescent; leaves narrowed to an obtuse apex, subentire, up to 4.5 cm. long; involucel of 5 (rarely 4) bractlets, these distinct (?), oblong-lanceolate, acute, 2–3 mm. wide; petals about 10 mm. long. Fruit unknown. Brazil..... .....*P. lanata* R. E. Fries. Note 36

50. Leaves discolorous, more densely pubescent (tomentose) on the lower surface. Carpels very rugose and with prominent tubercles (51).
50. Leaves not conspicuously discolorous, about equally pubescent on both surfaces or more so above (53).
51. Bractlets shorter than the calyx, broadly ovate or suborbicular (Note 37); petals rose (without basal spot?), about 20 mm. long. Leaves ⅓–⅔ as wide as long. Brazil (São Paulo) ....*P. Hoehnei* E. G. Baker var. *oblongifolia* R. E. Fries
51. Bractlets equaling or longer than the calyx or, if shorter, then narrower than in *P. Hoehnei;* petals pink with a dark purple basal spot. Leaves sagittate or hastate, crenate-dentate (52).
52. Peduncles 1–3 cm. long; bractlets cuneate-obovate (exceptionally oblong?) united toward base, 8–9 mm. long, about equaling the calyx; petals 20–25 mm. long; leaves ⅓–½ as wide as long. Brazil, Uruguay, Argentina .....*P. Urbaniana* Guerke
52. Peduncles 2–4 cm. long; bractlets linear-oblong or linear, distinct (?), (9?) 14–15 mm. long, considerably longer than the calyx; petals 30–35 mm. long; leaves ¼–⅓ as wide as long. Brazil..... .....*P. Malmeana* R. E. Fries
53. Bractlets much shorter than the calyx, suborbicular, very hirsute, 3-nerved; carpels rugose-tuberculate. Leaves ⅖–⅘ as wide as long, strigose-hirsute on both surfaces with long, few-armed hairs, the pubescence golden-yellow or ferruginous; petals deep red, 14 mm. long. Paraguay .....*P. rhodantha* Hochr.
53. Bractlets longer than the calyx; carpels reticulate, not tuberculate. Petals 15–17 mm. long. (54).
54. Leaves 1.5–4 cm. long, about ⅓ as wide as long, deeply sagittate, often reflexed, sparsely stellate-puberulent or glabrescent, ciliate on the margin with long, simple hairs; bractlets lanceolate or ovate-lanceolate, ciliate, 10–15 mm. long. Southern Brazil ....*P. reticulata* Garcke
54. Leaves not more than 1.5 cm. long, ⅗ as wide as long, loosely stellate-pubescent on both surfaces with long hairs; bractlets (rarely 6) linear or linear-oblanceolate, 6–9 mm. long. Petals red. Uruguay..... .....*P. nana* R. E. Fries
55. Bractlets (rarely 6) linear or lanceolate. Leaves ⅖–½ as wide as long, glabrous on both surfaces or sparsely stellate-pubescent on the veins; corolla pink, with a purple center; carpels obsoletely carinate, with 3 or 4 prominent transverse ridges, not muricate. Argentina (Misiones) .....*P. psilophylla* Ekman. Note 38
55. Bractlets broader, mostly (except in *P. Guerkeana)* obovate or spatulate (56).
56. Herbage with minute, pluricellular, capitellate, glandular hairs as well as stellate hairs. Leaves about ¾ as wide as long; bractlets spatulate-lanceolate, shorter than the calyx; petals up to 25 mm. long, pink with a dark purple basal spot; carpels described as not or obsoletely carinate, rugose-reticulate and somewhat tuberculate. Paraguay, Argentina .....*P. xanthogloea* Ekman. Note 39
56. Herbage not glandular (57).

57. Carpels strongly reticulate and (or) more or less tuberculate or muricate. Leaves sagittate, more or less discolorous, ¼–½ as wide as long; bractlets shorter than the calyx (58).
57. Carpels conspicuously reticulate but the reticulation less elevated, not (or exceptionally slightly?) tuberculate or muricate, strongly carinate (59).
58. Leaves about 3 times as long as wide, acute, regularly serrate, often reflexed; bractlets ovate-elliptic; carpels strongly reticulate and with 2 minute, subapical tubercles. Corolla not described. Brazil (Rio de Janeiro, Minas Geraes) ..... *P. prionophylla* R. E. Fries
58. Leaves about 4 times as long as wide, acuminate, coarsely toothed; bractlets lanceolate to ovate; carpels sharply muricate-tuberculate. Corolla rose with a dark purple center, up to 30 mm. long. Brazil (Minas Geraes, Paraná) ..... *P. Guerkeana* R. E. Fries. Note 40
59. Corolla about 6 mm. long, scarcely surpassing the calyx. Bractlets linear or narrowly oblanceolate-oblong, distinctly longer than the calyx; peduncles not longer than the petiole; carpels strongly carinate, lightly reticulate. Uruguay, Argentina..... ..... *P. consobrina* N. E. Brown. Note 41
59. Corolla larger (60).
60. Calyx with broad, subcordate, connivent lobes; petals red, 20–30 mm. long. Leaves ⅓ to equally as wide as long, deeply cordate-sagittate; bractlets (occasionally 6?) ovate or somewhat obovate. Brazil, Paraguay ..... *P. belophylla* Hochr. Note 42
60. Calyx not as in the preceding (or somewhat so in *P. pulchra);* petals rose with a dark purple basal spot (61).
61. Bractlets very broad, ovate, 5–6 mm. wide, nearly concealing the calyx; leaves ⅓–½ as wide as long, subhastate-subcordate, silky beneath, glabrescent above. Petals about 15 mm. long; fruit unknown. Argentina (Catamarca) ..... *P. eurychlamys* Ulbr.
61. Bractlets narrower, not concealing the calyx; leaves ⅓ to equally as wide as long, more or less sagittate at base (62).
62. Petals 30–40 mm. long; leaves less than twice as long as wide, deltoid-ovate, deeply subhastate-cordate. Bractlets linear-lanceolate, tomentose; calyx longer than the involucel, the broad lobes cordate; petals pale pink with a very dark purple base. Paraguay..... ..... *P. pulchra* Hochr. Note 43
62. Petals mostly not more than 25 mm. long; leaves mostly 2 or more times as long as wide. Brazil, Bolivia, Paraguay, Uruguay, Argentina, Chile. Varieties and forms of *P. hastata* Cav. (63).
63. Leaves nearly concolorous (64).
63. Leaves distinctly discolorous, whitish beneath (65).
64. Herbage glabrous or glabrate..... *P. hastata* var. *glabriuscula* Guerke
64. Herbage pubescent ..... *P. hastata* var. *subconcolor* Hassler. Note 44
65. Leaves oblong or lanceolate ....*P. hastata* var. *pubescens* Guerke f. *longifolia* Guerke. Note 45
65. Leaves suborbicular or broadly ovate, sometimes wider than long, subreniform..... *P. hastata* var. *pubescens* f. *brevifolia* Guerke. Note 46

66. Leaves (all or some of them) usually more or less distinctly lobed above the base (67).
66. Leaves (so far as is known, except occasionally in *P. mattogrossensis* and (?) *P. commutata)* not lobed above the base (69).
67. Carpels prominently tuberculate-cristate; petals not more than 20 mm. long. Herbage copiously glandular; leaves cordate, nearly concolorous, thin, ⅗ to nearly as wide as long; flowers solitary in the axils, often crowded at ends of the stem and branches; bractlets linear or lanceolate, usually about ½ as long as the calyx; petals rose-purple. Northern Argentina ..... *P. missionum* Ekman
67. Carpels not tuberculate, lightly reticulate; petals 25–30 mm. long. Leaves often shallowly lobed; bractlets (sometimes 6) about as long as the calyx (68).
68. Flowers in corymbs of 2–6; bractlets broadly lanceolate, 5-nerved; petals 25 mm. long, white. Paraguay ..... *P. Hassleriana* Chod.
68. Flowers in a lax panicle with very slender branchlets and peduncles; bractlets linear, 3-nerved; petals about 10 mm. long, drying pink. Brazil (Matto Grosso) ..... *P. gracilis* R. E. Fries. Note 47
69. Bractlets united well above the base (70).
69. Bractlets distinct or nearly so (73).
70. Calyx little if any longer than the involucel. Leaves pubescent above (71).
70. Calyx distinctly longer than the involucel. Petals 20–25 mm. long; carpels carinate and tuberculate (72).
71. Involucel-lobes relatively narrow, more than 3 times as long as wide, united only near the base; petals white, 35–40 mm. long, much longer than the involucel; leaves ⅔–⅘ as wide as long; carpels tuberculate-cristate. Paraguay ..... *P. sapucayensis* Hassler
71. Involucel-lobes relatively broad, ovate or deltoid; petals scarlet, much less than 35 mm. long, scarcely longer than the involucel; leaves ½ as wide as long; carpels obscurely reticulate. Brazil..... ..... *P. latifolia* (Nees & Mart.) Spreng.
72. Herbage rather coarsely pubescent; leaves coarsely dentate, ½–⅔ as wide as long; involucel-bractlets united nearly ½ their length; carpels broadly obovoid. Brazil. ..... *P. commutata* Garcke
72. Herbage finely puberulent; leaves obscurely and remotely crenate-serrulate, ⅖–¾ as wide as long, the margins more or less revolute; involucel-bractlets united about ¼ their length; carpels narrowly obovoid. Leaves discolorous; petals drying rose. Brazil..... ..... *P. Engleriana* Guerke
73. Petals (30?) 35–40 mm. long. Involucel shorter to somewhat longer than the calyx (74).
73. Petals not more than 30 mm. long (75).
74. Herbage without glandular hairs, copiously hirsute with relatively long, stellate hairs; bractlets oblong-ovate or lanceolate; leaves ovate, ovate-oblong, or elliptic-lanceolate, ⅓–½ as wide as long, acute or acuminate, rounded or subcordate at base, deeply serrate; petals red or sometimes white; carpels very tuberculate-rugose. Brazil, Argentina ..... *P. Schrankii* Spreng. Note 48

74. Herbage with glandular hairs; bractlets linear-lanceolate; leaves broadly ovate, ¾ to nearly as wide as long, acute, deeply cordate; petals white with a purple basal spot; carpels prominently rugose-reticulate. Bractlets rarely 6 in number. Paraguay.....*P. Rojasii* Hassler

75. Bractlets broadly ovate or suborbicular, much shorter than the calyx. Leaves ½–⅗ as wide as long, crenate-serrate, discolorous, cinereous-velutinous beneath; petals rose, about 20 mm. long; fruit unknown. Brazil .....*P. Hoehnei* E. G. Baker. Note 49

75. Bractlets narrower. Carpels carinate; leaves cordate with an open sinus (76).

76. Stems more or less decumbent; leaves suborbicular or subreniform to ovate, about as wide as long, deeply crenate or crenate-dentate; bractlets (sometimes 6) shorter than to about equaling the calyx, lanceolate or spatulate; petals white, with a dark purple basal spot, 20–25 mm. long; carpels reticulate-rugose, pubescent. Brazil, Bolivia, Uruguay, Argentina, and (?) Chile .....*P. glechomoides* A. Juss.

76. Stems (presumably) erect or ascending; leaves ovate (to nearly quadrate?), ½ to equally as wide as long, shallowly crenate-dentate; bractlets slightly longer than the calyx, narrowly oblong or lanceolate; petals (when dry) white with a yellowish base, 25–30 mm. long; carpels tuberculate. Leaves (in var. *lobata* Hassler) distinctly but shallowly 3-lobed. Brazil, Paraguay .....*P. mattogrossensis* R. E. Fries. Note 50

77. Bractlets of the involucel seldom more than 9. Note 51. (78).

77. Bractlets (except occasionally in *P. Balansae, P. spinistipula,* and *P. surumuensis)* 10 or more (94).

78. Flowers usually clustered, the inflorescences corymbose, racemose, or paniculate (79).

78. Flowers solitary or sometimes geminate in the leaf-axils (83).

79. Inflorescence an open, usually leafy panicle, the flowers often subcorymbosely clustered at ends of the branchlets. Herbage usually glandular-pilose, the stems with or without long, spreading hairs; leaves ovate (usually broadly so), often more or less trilobate (rarely deeply so); bractlets 6–12, subulate or filiform, much longer than the calyx; petals yellow, 10–12 (15?) mm. long; carpels obovoid-trigonous, muticous, rugose-reticulate. Venezuela, Colombia, Peru, Bolivia, Brazil, (and northern Argentina?); North America.*P. paniculata* Cav. Note 52

79. Inflorescence otherwise (80).

80. Flowers (the lower ones) rather long-pedunculate, in a (usually elongate) very open, terminal raceme; petals usually about 2 cm. long, yellow, yellowish, or greenish-white. Plants mostly litoral, sometimes growing in mangrove swamps, shrubby or arborescent; herbage stellate-tomentulose or -pilosulous, then glabrescent; leaves usually sharply long-acuminate, the margin entire or sparingly denticulate; bractlets lanceolate or oblong-lanceolate; carpels elongate, rather narrowly obovoid-trigonous, prominently keeled, lightly reticulate (81).

80. Flowers mostly in corymbiform, short-stalked clusters at ends of the stem and branches; petals up to 5 cm. long (82).

81. Leaves broadly ovate or suborbicular, more or less cordate at base, 5–7-nerved from the base; bractlets 6–10, usually longer than the calyx; carpels with 3 thick, triangular, apical crests, these sometimes obscure. Northern South America; North America.....*P. spicata* Cav. Note 53

81. Leaves ovate-lanceolate, elliptic, or (exceptionally) slightly obovate, subcuneate at base, 3-nerved from the base; bractlets 5–8, about ⅔ as long as the calyx; carpels with a stout apical cusp. Colombia .....
.....*P. Rhizophorae* Killip

82. Leaves 1-nerved, lanceolate or ovate-lanceolate, 1/10–⅓ as wide as long; bractlets (occasionally 10) subulate-filiform, shorter than the calyx; petals 4 cm. long; carpels distinctly transverse-rugose. Guiana, Brazil
.....*P. angustifolia* Benth.

82. Leaves 5- or more-nerved, suborbicular to oblong-elliptic, ½ to nearly as wide as long, rounded or subcordate at base, subsessile or shortly petiolate; bractlets lanceolate-spatulate to nearly filiform, nearly equaling to somewhat longer than the calyx; petals 2–5 cm. long, red with a dark purple basal spot; carpels rather obscurely transverse-veiny, dehiscent, splitting into 2 valves. Herbage densely hirsute or tomentose with (usually long) yellowish, stellate hairs; flowers very shortly pedunculate, mostly in small clusters, exceptionally solitary. Colombia, Venezuela, Guiana, Bolivia, Brazil, Paraguay.....
.....*P. speciosa* H.B.K. Note 54

83. Petals 4–7 mm. long, white. Stems cinereous-puberulent, sometimes also sparsely hirsute with very long and fine, simple hairs; leaves ovate to lanceolate, rounded to shallowly cordate at base, long-acuminate, crenate-serrate, inconspicuously pubescent or puberulent; flowers solitary in the axils, long-pedunculate; involucel of 6–8, linear, acute, hirsute-ciliate bractlets; carpels subrotund, muticous, smooth and nearly glabrous, thin-walled, very dehiscent. Panama and Colombia
.....*P. alba* Seem. Note 55

83. Petals 10 mm. or longer and (except in *P. albiflora)* yellow or purple (84).

84. Involucel less than ½ as long as the calyx, the bractlets linear, glandular-tomentose. Herbage glandular-pubescent; leaves sessile or nearly so, suborbicular, sharply dentate, up to 3 cm. long, crowded at ends of the branches; petals purple; carpels rugulose-veiny, shortly appressed-pubescent. Brazil (Bahia) .....*P. almasana* Ulbr.

84. Involucel from nearly as long as to longer than the calyx (85).

85. Bractlets suborbicular or rounded-spatulate, 1.5 times as long as the calyx. Leaves cordate at base; petals 15–17 mm. long, lemon-yellow; carpels glabrous, nearly smooth. Paraguay.....
.....*P. platyloba* R. E. Fries. Note 55a

85. Bractlets linear or lanceolate (86).

86. Petals white, without a basal spot, (18) 20–28 mm. long. Herbage glandular; leaves ovate, cordate, caudate-acuminate; bractlets 7–9, very acute, nearly twice as long as the calyx; carpels muticous, glabrous (or minutely puberulent?), nearly smooth. Ecuador....*P. albiflora* R. E. Fries

86. Petals yellow or rose with or without a basal spot (87).

87. Corolla rose with a dark purple center, 18–25 mm. long. Herbage usually stellate-tomentose and with very long, simple hairs and also glandular hairs; leaves narrowly ovate to suborbicular, cordate, acute to long-acuminate, sometimes obscurely sublobate; flowers solitary or geminate, long-pedunculate; involucel of 7–9 bractlets, these 1–2 mm. wide, longer than the calyx, up to 3 times as long; carpels rugose-reticulate dorsally, the margins nodulose-tuberculate. Colombia, Ecuador, Peru, Brazil. ..... *P. mollis* H.B.K. Note 56

87. Corolla yellow or yellowish, with or without a dark center (88).

88. Carpels conspicuously mucronate, or else wing-margined (89).

88. Carpels muticous or mucronulate. Flowers solitary, often somewhat clustered at apex of stem and branches (90).

89. Flowers mostly in pairs; carpels not wing-margined; herbage viscid, with numerous glandular hairs; bractlets 7–9 (10), narrowly linear, nearly twice as long as the calyx; petals 11–13 mm. long; carpels glabrous, somewhat rugose-reticulate toward the margins, acutely mucronate. Guiana and Brazil (Bahia, Ceará, Rio de Janeiro) .... *P. geminiflora* Moric.

89. Flowers solitary; carpels wing-margined; herbage not glandular; bractlets 6 or 7, linear, 3 times as long as the calyx; petals about 24 mm. long. Paraguay ..... *P. apiculata* R. E. Fries. Note 57

90. Carpels muticous, not (?) crested; petals 13–14 mm. long, without basal spot, the claws glabrous. Leaves deltoid or deltoid-ovate, sometimes subhastately angulate at base; bractlets 6–8, linear, 1.5–2 times as long as the calyx. Brazil (Matto Grosso) ..... *P. immaculata* R. E. Fries

90. Carpels with a low, laterally flattened apical crest (elevated portion of the midrib); petals seldom less than 15 mm. long, the claws (in *P. campestris?)* pubescent. Note 58. (91).

91. Stems hirsute with very long, simple hairs, intermixed with short, simple and stellate hairs and (usually numerous) glandular hairs; corolla often without a dark center. Bractlets 6–8 (rarely more?), up to 2.5 mm. wide (92).

91. Stems puberulent or tomentose, sometimes also sparsely villous with long, simple hairs, with few or no glandular hairs; corolla usually with a conspicuous dark center (93).

92. Bractlets obtuse or acutish, about 1.5 times as long as the calyx. Argentina and Bolivia ..... *P. argentina* Guerke. Note 59

92. Bractlets acute, 2–2.5 times as long as the calyx. Paraguay .... *P. campestris* R. E. Fries. Note 60

93. Stems puberulent or short-villous, the plants not conspicuously pubescent; bractlets usually 2–3 times as long as the calyx, narrowly linear, seldom more and often less than 1 mm. wide. Flowers on long, spreading peduncles, these up to 9 cm. long. Brazil, Bolivia (?), Paraguay, Argentina ..... *P. Hieronymi* Guerke. Note 61

93. Stems more or less tomentose, the plants conspicuously soft-pubescent; bractlets usually about twice as long as the calyx, lanceolate or linear-lanceolate, (1) 2–3 (4) mm. wide. Peru, Venezuela, Guiana, Bolivia, Brazil, Paraguay, Argentina ..... *P. sidifolia* H.B.K. Note 62

94. Bractlets 10–14 or (in *P. Balansae, P. melanostyla?, P. orbicularis, P. speciosa, P. spinistipula, P. surumuensis)* sometimes fewer than 10, occasionally (in *P. laetevirens, P. subhastata,* and ? *P. pterocarpa)* as many as 15 or 16 (95).

94. Bractlets 15 or more, or (occasionally in *P. piauhyensis)* only 14 (111).

95. Petals (except sometimes in *P. speciosa* and ? *P. orbicularis)* 3 cm. or longer (96).

95. Petals mostly less than 3 cm. long (103).

96. Carpels apically cornute, pubescent. Stems tomentose; leaves often subtrilobate, tomentose on both surfaces; flowers solitary in the axils; bractlets 9–11, linear, equaling or somewhat shorter than the calyx; petals 30–35 mm. long (97).

96. Carpels not cornute, or (in *P. orbicularis?)* slightly so (98).

97. Leaves subsessile, narrowed or subcordate at base, up to 7 cm. long and less than ¾ as wide; bractlets about 10 mm. long; corolla campanulate, lilac, the petals obovate, nearly ½ as wide as long; carpels about 5 mm. long, with 2 lateral, triangular horns. Brazil (Amazon region) ..... *P. surumuensis* Ulbr.

97. Leaves distinctly petioled, cordate at base, 3–6 cm. long and nearly as wide; bractlets about 17 mm. long; corolla tubular-campanulate, drying pinkish-yellow, the petals narrowly lanceolate; carpels about 10 mm. long, with 5 short, obtuse apical horns. Brazil (Bahia) .... *P. Zehntneri* Ulbr. Note 63

98. Flowers mostly crowded at apex of the stem and branches, very short-pedunculate; bractlets oblanceolate to nearly filiform, 8–12 in number, nearly equaling to somewhat longer than the calyx. Stems densely hirsute or tomentose with usually long hairs; leaves suborbicular to oblong-elliptic, rounded or subcordate at base, subsessile or short-petiolate; petals 20–50 mm. long, red with a dark purple basal spot; carpels 4–5 mm. long, very obtuse, muticous, rather obscurely transverse-veiny. Colombia, Venezuela, Guiana, Brazil, Paraguay ..... *P. speciosa* H. B. K. Note 64

98. Flowers mostly solitary in the axils, long-pedunculate; bractlets subulate or filiform (99).

99. Petals white, sometimes with a red base; stems hispid with long (2–3 mm.), 2–6-armed hairs, also glandular; bractlets shorter than the calyx. Leaves oval, elliptic, or suborbicular, ½–⅔ as wide as long; bractlets about 12, from 12–17 mm. long, hispid like the stems; carpels 7 mm. long, rugulose, very minutely and sparsely glandular. Paraguay ..... *P. aspera* Hassler

99. Petals not white; stems more or less tomentose, often with fewer long, spreading, simple hairs; bractlets equaling or longer than the calyx (100).

100. Stems densely glandular-tomentose; petals about 45 mm. long, pink; carpels narrowly winged toward base, 6.5 mm. long. Leaves rounded-ovate, acute, cordate at base, 4–6 cm. long and very nearly as wide; bractlets about 14, terete, 20 mm. long and barely 1 mm. wide. Brazil (Minas Geraes) ..... *P. pterocarpa* R. E. Fries

100. Stems not glandular, or sparsely so in *P. orbicularis;* petals less than 45 mm. long; carpels not winged, 5–6 mm. long (101).

101. Leaves rather deeply 3-lobed, the lobes rather coarsely crenate-serrate; bractlets nearly twice as long as the calyx. Corolla yellow, tinged with red; carpels trigonous-obovoid, rugose. Paraguay .... *P. patululoba* Hochr. Note 65

101. Leaves not or obscurely lobed; bractlets about equaling the calyx (102).

102. Herbage velutinous; leaves ½–⅘ as wide as long, broadly ovate or suborbicular, deeply cordate at base; bractlets 12, from 15–17 (22?) mm. long; petals 35–40 mm. long, pink with a deep red basal spot; carpels reticulate-veiny on the back, smooth on the sides. Brazil (southern) ..... *P. grandiflora* A. Juss.

102. Herbage hirsute and subtomentose; leaves often wider than long, orbicular or reniform, not angulate, cordate or subcordate at base; bractlets 9–11, from 9–13 mm. long; petals 20(?)–30 mm. long, in anthesis bright yellow with a purple basal spot; carpels rugose with (usually) 3 transverse ridges. Paraguay, Argentina (Corrientes)... ..... *P. orbicularis* Ulbr. Note 65a

103. Bractlets (2?) 3–4 times as long as the calyx; carpels 7–9 mm. long, shortly rostrate, reticulate-rugose. Plants shrubby; stems more or less densely stellate-puberulent and usually also hirsute with very long and fine, simple hairs; leaves ovate or suborbicular, acute or acutish, the larger ones 2–5 (8?) cm. long and nearly as wide; flowers solitary or in small, apical clusters; bractlets 10–14, lanceolate, long-ciliate, 8–16 mm. long; petals red or pink, 15–25 mm. long. Brazil, northern Argentina ..... *P. rosa-campestris* Juss.

103. Bractlets not more than twice as long as the calyx; carpels not more (usually less) than 7 mm. long (104).

104. Petals 20 mm. or longer. Bractlets subulate-filiform, more or less arcuate (105).

104. Petals (except sometimes in *P. Balansae?)* less than 20 mm. long. Flowers clustered at ends of the branchlets or the lower ones solitary (108).

105. Leaves not lobed; petals red, 22–25 mm. long. Stems hispid with very long, spreading or retrorse, simple hairs, also stellate-pubescent; leaves long-petioled, ovate, cordate, about ½ as wide as long; stipules spreading, subulate-filiform, almost spinose, persistent; flowers solitary in the axils; bractlets 9–12, about twice as long as the calyx, 25–30 mm. long; carpels 6–7 mm. long, glabrous, obscurely rugose, 3-mucronate. Brazil (Bahia) ..... *P. spinistipula* Guerke

105. Leaves normally lobed; petals yellow, 15–25 (35?) mm. long. Bractlets 10–16 (106).

106. Herbage with very short, glandular and long, non-glandular, very slender, simple hairs; leaves elongate, usually subhastately lobed at base, up to 12 cm. long. Plants shrubby; flowers solitary in the axils, somewhat crowded at ends of stem and branches, rather long-peduncu-late; bractlets subulate-filiform, usually considerably longer than the calyx, conspicuously hirsute with long, simple hairs; carpels obovoid-

trigonous, reticulate-rugose, glabrous, 4–5 mm. long. Colombia, Ecuador, (Brazil?, Paraguay?, Argentina?) .....
.....*P. subhastata* Tr. & Planch. Note 66

106. Herbage eglandular; leaves broad, palmately lobed. Flowers mostly in corymbiform clusters (107).

107. Stems stellate-tomentose; carpels 5–6 mm. long, conspicuously veiny (almost cristate) on the sides. Brazil (Matto Grosso) .....
.....*P. opulifolia* S. Moore

107. Stems rather sparsely pubescent with strigillose, stellate hairs, these papillate at base, also with a line of tomentum; carpels scarcely 5 mm. long, reticulate-rugose and somewhat tuberculate at apex, irregularly triquetrous. Paraguay and (?) northern Argentina .....
.....*P. vitifolia* Hochr. Note 67

108. Leaves 1-nerved from the base, lanceolate, not more than ¼ as wide as long, obtuse or rounded at base; petals red, 11–12 mm. long. Stems subtomentose with short stellate hairs; carpels 3–3.5 mm. long, rugose. Brazil (Minas Geraes) .....*P. Schwackei* Guerke

108. Leaves with 3 or more nerves from the base; petals yellow (109).

109. Bractlets thick, subterete, nerveless, tomentose. Herbage velutinous; leaves broadly ovate or suborbicular, deeply cordate, sometimes obscurely trilobate; flowers solitary in the axils and somewhat crowded apically; bractlets 9–11, up to 1.5 times as long as the calyx; petals 13–16 (20?) mm. long; carpels 4–5 mm. long, muticous, obscurely rugose-reticulate, splitting into 2 valves at maturity. Paraguay ...
.....*P. Balansae* Guerke. Note 67a

109. Bractlets otherwise (110).

110. Leaves elongate, normally subhastately lobed; petals 15 mm. long; carpels 4–5 mm. long. (See also first paragraph 106.) .....
.....*P. subhastata* Tr. & Planch.

110. Leaves not (?) elongate and subhastately lobed; petals about 10 mm. long; carpels 3.5 mm. long. Stems glandular-pilose and with longer, rigid, simple hairs; leaves round-ovate, oblong, or lanceolate, sometimes angulate or shallowly 3–5-lobed; bractlets 13–15, twice as long as the calyx; petals yellow or orange (?), somewhat more deeply colored at base; carpels glabrous, somewhat reticulate. Brazil (Matto Grosso) .....*P. laetevirens* R. E. Fries. Note 68

111. Androecium 10–11 cm. long, very slender, very long-exserted. Stems velutinous-tomentose; leaves ovate or suborbicular, 7–9 cm. long and nearly as wide; flowers solitary, bractlets 19–22, linear-subulate, (20) 25–27 mm. long, about equaling the calyx; petals about 30 mm. long, yellow with red basal spot and veins; styles 1 cm. longer than the stamen-column. Brazil (Bahia, Minas Geraes) .....
.....*P. macrostyla* Guerke. Note 69

111. Androecium much less than 10 cm. long, not exserted (112).

112. Stems prostrate; carpels usually 3-mucronate or 3-cuspidate, the cusps much shorter than the body of the carpel, usually stout. Flowers solitary, the peduncles elongate; bractlets 14–18, very narrow, conspicuously hirsute or hispid (in *P. cochensis?*), longer than the calyx (113).

112. Stems mostly erect or ascending; carpels not tricuspidate (115).

113. Leaves ovate, not (?) lobed, 3 cm. long and nearly as wide; bractlets about 10 mm. long. Corolla and stamens unknown. Venezuela (Coche Island) ..... *P. cochensis* J. R. Johnst. Note 71

113. Leaves more or less deltoid, often angulate-lobed; bractlets mostly more than 10 mm. long. Stamen-column antheriferous to the base; petals yellow; carpels rugose (114).

114. Petals 18–25 mm. long, with a dark purple basal spot; stems usually more or less hirsute with long, simple hairs, sometimes also glandular-pubescent; leaves subdeltoid, often trilobate, deeply cordate or hastate-cordate, up to 5 (6) cm. long, about as wide as long; bractlets 9–15 mm. long, distinct; androecium 10 mm. long; carpels with sharp edges or narrowly winged, shortly triaristate to merely 3-mucronate. Colombia, Venezuela, Guiana, Brazil, Bolivia ..... *P. cancellata* (L.f.) Cav.

114. Petals 30–40 mm. long, without (?) a basal spot; stems velutinous, usually without long, simple hairs; leaves deltoid, more or less 3–5-lobed, up to 8 cm. long, usually wider than long; bractlets 15–20 mm. long; androecium 20–25 mm. long; carpels not winged, 3-mucronate or 3-cuspidate. Brazil (Bahia, Alagoas, Rio de Janeiro) ..... *P. humifusa* Juss.

115. Corolla not more than 15 mm. long (116).

115. Corolla not less than 25 mm. long (117).

116. Stems velutinous; leaves deeply 3–5-lobed, up to 10 cm. long, ⅔ to nearly as wide as long; bractlets lanate; petals purple, 12–15 mm. long; androecium ⅗–⅔ as long as the petals; styles not exserted; carpels muticous or nearly so. Leaves very variable in shape. Brazil (Bahia) ..... *P. piauhyensis* Ulbr.

116. Stems glandular-tomentose, soon glabrescent; leaves deltoid-ovate, shallowly 3-lobed, up to 4 cm. long, ½–⅝ as wide as long; bractlets densely hirsute; petals purple to blood-red, 10–12 mm. long; androecium equaling the petals; styles exserted; carpels (as described) short-awned apically and dorsally. Brazil (Bahia) ..... *P. Philippi* Ulbr. Note 72

117. Petals 45–50 mm. long. Herbage densely velutinous; leaves broadly ovate or suborbicular, the nerves very prominent beneath, the lower leaves 5–6 cm. long and equally wide; flowers solitary, rather long-pedunculate; bractlets 16–17, subulate-filiform, 20–30 cm. long, 1.5 times as long as the calyx; androecium about ⅘ as long as the petals; carpels 5 mm. long, muticous, obscurely reticulate-rugose, narrowly margined toward base, glabrous. Brazil (Goyaz, Matto Grosso) ..... *P. Pohlii* Guerke. Note 73

117. Petals not more than 35 mm. long (118).

118. Bractlets shorter than to only slightly longer than the long, narrow calyx; carpels 6–7 mm. long, muticous, reticulate-rugose, glabrous. Stems pubescent with short, glandular hairs and longer, simple, spreading hairs; leaves ovate or orbicular, occasionally angulate or subtrilobate, up to 8 cm. long, ⅗ to nearly as wide as long; flowers solitary in the axils and clustered at apex of the stem and branches; bractlets 15–18, narrowly linear-lanceolate, pubescent and rather long-

ciliate, 15–17 mm. long; petals 30 mm. long, ⅓ as wide. Brazil (and Argentina?) ..... *P. viscosa* A. Juss.

118. Bractlets 1.5–3 times as long as the calyx, narrowly linear or subulate; carpels 4–5 mm. long, mucronate (119).

119. Carpels broadly 2-winged, pubescent, reticulate-veiny; stems appressed-hairy with short, rigid, stellate hairs; leaves subdeltoid, hastate-cordate, 2–4 cm. long, ½–¾ as wide as long; flowers solitary, long-pedunculate; bractlets 20–25 in number, 15–25 mm. long; petals violet (when dry), 25–30 mm. long; androecium about ⅓ as long as the petals. Brazil (Bahia) ..... *P. Blanchetiana* Miq.

119. Carpels not winged, glabrous, reticulate-rugose dorsally; stems densely white-tomentulose with very short hairs. Leaves ovate or suborbicular, deeply cordate with often overlapping basal lobes, up to 7 cm. long, nearly as wide as long; flowers solitary and sometimes in terminal subcorymbose clusters; bractlets 15–17 in number, 22–25 mm. long; petals red, 30–35 mm. long, less than ⅓ as wide; androecium about ⅔ as long as the petals. Brazil (Minas Geraes) ..... *P. Aschersoniana* Guerke

NOTES

1. Basonym: *P. polymorpha* St. Hil. Synonyms: *P. nudicaulis* St. Hil., *P. Edouardii* Hochr. — *P. speciosa* usually has non-peltate, although often spatulate bractlets and therefore is keyed also in section *Eupavonia* (second paragraph 82 and first paragraph 98 of this key).

2. Not seen. Characters from Uittien, in Meded. Bot. Mus. Ryksunivers. Utrecht. No. 39 (Rec. Trav. Bot. Néerl. 33:770).

3. Synonyms: *P. bracteosa* Benth., *P. involucrata* Klotzsch. Two varieties were distinguished in Fl. Bras.: var. *obtusifolia* Guerke and var. *acutifolia* Guerke.

4. Synonyms: *Peltobractea nigrobracteata* Rusby, *Pavonia nigrobracteata* (Rusby) Uitt. Petals described by Rusby as salmon-pink, by Klug as flesh-red.

5. Characters from Presl's description of *Malachra ovata* Presl, the name on which Standley's name was based. (*Pavonia ovata* Spreng. is an older name.)

6. From Fl. Bras. 12³: 479, 522-524. *P. Zehntneri* Ulbr., here keyed under *Eupavonia* (second paragraph 97), was described as having a tubular-campanulate calyx, but with lobes nearly as long as the tube.

7. The shape of the calyx and the degree to which it is cleft are unknown for *P. Hoehnei* and *P. subrotunda*.

8. The type *(Sellow 1426)* had suborbicular, coarsely and irregularly dentate leaves, very different from the ovate-lanceolate, attenuate-acuminate, subentire leaves of the type of var. *velutina* Guerke *(Glaziou 14507)*.

9. From Fl. Bras. 12³: 479, 525-527.

10. The number of leaf-nerves is unknown for *P. Hoehnei, P. nana, P. subrotunda*, and *P. surumuensis*. Only the last has been reported from Brazil, so far as the writer knows. Since all of these have relatively broad, and several of them more or less lobed, leaves, it seems safe to assume that the leaves are at least 3-nerved at base. Two species of Section *Eupavonia, P. angustifolia* Benth. (first paragraph 82) with petals 50 mm. long, and *P.*

Schwackei Guerke (first paragraph 108) with 11 or 12 bractlets, were described as having 1-nerved leaves.

11. Synonym: *P. bahiensis* Guerke. The same collection *(Blanchet 2117)* was cited as the type of both *P. calyculosa* and *P. bahiensis.* (See Ann. Sci. Nat. ser. 2, 18:40.)

12. The distinction between "cuspidate" and "mucronate" is purely arbitrary but in this key, if the apiculation is much more than 0.5 mm. long, the carpel is characterized as cuspidate. In *P. paniculata* of Section *Eupavonia* (first paragraph 79) the carpels have "sometimes a short weak spine at apex," fide Fawcett and Rendle (Fl. Jamaica 5:131).

13. Also keyed in section *Eupavonia,* second paragraph 89. Fries considered it allied to *P. sidifolia* and *P. campestris.*

14. Also keyed in Section *Eupavonia,* second paragraph 116, because Ulbrich thought it very close to *P. piauhyensis,* which apparently has muticous carpels.

15. Synonym: *P. begoniaefolia* Gardner.

16. It is doubtful that this species belongs properly to section *Typhalaea,* since Ulbrich thought it nearest *P. macrostyla* Guerke, which has winged but awnless carpels.

17. *P. Spinifex* var. *genuina* Guerke is cited from Peru in Fl. Bras. and *Ferreyia 7072* from Dep. Cajamarca of that country seems typical. Specimens from Colombia with relatively small flowers (petals 12–20 mm. long) and included androecium and styles but with carpel-awns as in *P. Spinifex* may constitute a new species. The herbage is very sparsely pubescent.

18. Synonyms: *P. Regnelliana* Miq., *P. Spinifex* ssp. *communis* (St. Hil.) Guerke. Leaves are usually longer and broader and the carpel-awns mostly shorter and stouter than in West Indian specimens of *P. Spinifex.*

19. *P. Martii* Colla, of Brazil, if a distnict species, should be inserted somewhere between paragraphs 24 and 43. Colla thought it related to *P. Spinifex* Cav. but with much smaller (narrower?), elongate leaves and terminal peduncles. He described it also as having 10–12 linear bractlets, petals about 12 mm. long, and elongate carpel-awns, it being different in all of these characters from *P. Spinifex.*

20. Synonym: *P. Typhalaea* (L.) Cav. The petals in *W. H. Camp E841,* from Ecuador, were noted as "pale lavender."

21. Synonym: *P. flava* Spring and perhaps *P. ageratoides* Rusby. *P. sepium* var. *Balansae* Guerke approaches *P. Spinifex* in its broad, often thickish leaves, relatively large flowers, and usually relatively short carpel-awns.

22. Of Arechavaleta (1898), perhaps only a form of *P. sepium.* Not *P. urticaefolia* Presl (1835).

23. This species, apparently, is very close to *P. Goudotiana.*

24. This and the two following species are keyed also in section *Eupavonia,* to which they more properly belong. (See paragraphs 113 and 114.)

25. In var. *deltoidea* (Mart.) St. Hil. & Naud. *(P. deltoidea* Mart.), the hairs of the herbage are mostly long, appressed, and simple and the leaves are acute, with more or less acute basal lobes.

26. Synonym: *P. prostrata* Moric.

27. Very like *P. fruticosa* in general appearance, differing chiefly in the more numerous, narrower, less-united bractlets. As was pointed out by Garcke (Jahrb. K. Bot. Gart. Berlin 1:208), there is an older *P. rosea* (of Wallich ex Moris). If this name was validly published, the name *P. nemoralis* St. Hil. is available for the American plant. Specimens from Colombia in the U. S. Nat. Herb. *(Pennell & Killip 5731, Killip 6143, Killip & Hazen 8782, Rusby & Pennell 617)* with white corollas, are atypical in having the flowers mostly solitary and long-peduncled.

28. Synonyms: *P. costaricensis* Hochr., *P. fulva* (Standl.) Standl. Perhaps not distinct from *P. pseudotyphalaea.*

29. Synonym: *P. nana* Ulbr. non R. E. Fries.

30. Doubtfully distinct, as a species, from *P. peruviana.*

31. Perhaps not specifically distinct from the inadequately known *P. castaneaefolia.*

32. *P. betonicaefolia* Presl, of Peru, with leaves ovate to oblong-lanceolate, obtuse at apex, subcordate at base, apparently belongs in this section (paragraphs 46–76) but Presl did not mention the number of nerves of the bractlets and calyx-lobes. Petal-color has not been described for *P. commutata, P. consobrina, P. glandulosa, P. lanata, P. prionophylla,* and *P. reticulata.*

33. Several of the plants in this relatively narrow-leaved group (paragraphs 48–65) were reduced by Hassler to varieties of *P. hastata* Cav.

34. Bractlets 3–5-nerved in *P. hastata* fide R. E. Fries (Kgl. Sv. Vet. Akad. Handl. ser. 2, 42^{12}:56).

35. Synonyms (fide Fl. Bras.): *P. affinis* A. Juss., *P. distinguenda* St. Hil. & Naud., *P. viscidula* St. Hil. & Naud. Fries (ibid., p. 51) stated that *P. sagittata* has strictly sagittate leaves and reticulate but not sculptured carpels (see his t. 6, figs. 3, 4).

36. Related to *P. sagittata* fide R. E. Fries (ibid., p. 52).

37. As described by Baker f. for typical *P. Hoehnei* (see first paragraph 75). Fries did not describe the bractlets of var. *oblongifolia,* so presumably they are similar.

38. Compare *P. hastata* var. *glabriuscula* Guerke (first paragraph 64).

39. The number of bractlets was not stated by Ekman, but presumably is normally 5. The specimens I have determined tentatively as *P. xanthogloea* have distinctly carinate carpels. This species was stated to be intermediate between *P. hastata* and *P. psilophylla* Ekman.

40. Synonym: *P. hastata* var. *pubescens* f. *longifolia* Guerke, in part (compare first paragraph 65).

41. Carpel-characters from illustration in R. E. Fries (Sv. Vet. Akad. Handl. ser. 2, 42^{12}: t. 6, figs. 19, 20).

42. Synonym: *P. hastata* var. *grandiflora* Hassler forma *belophylla* (Hochr.) Hassler but considered a good species by Fries (Sv. Vet. Akad. Handl. ser. 2, 42^{12}:49) who questioned Hassler's reduction of so many species to varieties and forms of *P. hastata.* Hochreutiner compared the calyx to that of *Sida physocalyx.*

43. Synonym: *P. hastata* var. *grandiflora* Hassler forma *pulchra* (Hochr.) Hassler. This also was recognized as a species by Fries (ibid., p. 54) who

stated that it differs from *P. belophylla* in the shorter and broader, more deltoid leaves, and large flowers.

44. Synonyms: *P. bullulata* Hochr., *P. hastata* var. *subconcolor* forma *bullulata* (Hochr.) Hassler.

45. Compare *P. Guerkeana* R. E. Fries (second paragraph 58).

46. Synonym: *P. Cymbalaria* St. Hil. & Naud.

47. Fries thought this species related to the yellow-flowered *P. paniculata* Cav. but differing in having the petals rose-colored when dried, fewer bractlets, etc.

48. Synonym: *P. muricata* St. Hil. (see Fl. Bras. 12^3:498).

49. See also var. *oblongifolia* R. E. Fries (first paragraph 51 of this key).

50. Nearest *P. commutata* Garcke according to R. E. Fries (Sv. Vet. Akad. Handl. ser. 2, 42^{12}:50). Compare first paragraph 71 of this key.

51. Exceptionally as many as 12 in *P. paniculata. P. subrotunda* St. Hil. & Naud., described as having 8–10 bractlets, is too little known for inclusion in this key.

52. Synonym: *P. subtriloba* Rusby, probably also *P. restiaria* Bertoni. See also *P. subhastata* Tr. & Planch.

53. Synonyms: *P. racemosa* Sw., *P. scabra* (B. Vog.) Cif., non Presl. *P. spicata* and *P. Rhizophorae* constitute a very distinct group in Section *Eupavonia*. See Leafl. West. Bot. 7:119.

54. See also first paragraph 98. Bractlets linear and apically dilated into a peltate bladelet in ssp. *polymorpha* (St. Hil.) Guerke (see first paragraph 3). Synonyms of *P. speciosa: P. grisea* St. Hil. & Naud., *P. Hostmanni* Miq., *P. canaminensis* Rusby, and *Hibiscus rhomboideus* Rusby.

55. Synonyms: *Malache panamensis* Standl., *Pavonia panamensis* (Standl.) Standl. A collection, *Fosberg 19477,* from Uribe, Cordillera Oriental, Colombia, has larger flowers than in any other specimen seen previously (petals 7 mm. long) and the stems are rather sparsely hirsute with very long and very fine hairs.

55a. Synonym: *Asterochlaena platyloba* (R. E. Fries) Hassler.

56. Synonyms: *P. Mutisii* H.B.K., *P. Kunthii* Guerke. According to Garcke (Jahrb. Bot. Gart. Berlin 1:203), the involucel is sometimes shorter than the calyx in this species, but this must be an exceptional condition. *Asterochlaena cuspidata* Garcke, based upon a collection in Peru, may possibly be a form of *Pavonia mollis,* but Garcke did not describe the corolla, so it cannot be identified positively with any of the species in this key.

57. Synonym: *Asterochlaena Hieronymi* (Guerke) Hassler ssp. *longipila* Hassler var. *apiculata* (R. E. Fries) Hassler. See also first paragraph 18 of this key.

58. The four following species apparently intergrade.

59. Synonyms: *P. Bangii* Ulbr., *Asterochlaena argentina* (Guerke) Stuckert.

60. Doubtfully distinct from *P. argentina.* Synonym: *Asterochlaena sidifolia* (H.B.K.) Hassler ssp. *genuina* Hassler var. *campestris* (R. E. Fries) Hassler.

61. Synonyms: *P. Morongii* S. Moore, *Asterochlaena Hieronymi* (Guerke) Hassler, *A. Morongii* (S. Moore) Hassler. See E. Hassler, Repert. Sp. Nov. 8:118.

62. Synonyms: *P. diuretica* St. Hil., *P. sidifolia* ssp. *diuretica* Guerke, a form without long, simple, stem-hairs; *Asterochlaena sidifolia* (H.B.K.) Hassler.

63. This and *P. surumuensis,* as well as *P. Pohlii* Guerke (first paragraph 117) were referred by Ulbrich to "section *Lopimia*" (Notizbl. Bot. Gart. Berlin 6:327 and 9:45) but the descriptions of the calyx and fruit of these three species do not indicate that they belong to the genus *Lopimia* as I understand it. (See Amer. Midl. Nat. 46:99, 106.)

64. See also first paragraph 3 and second paragraph 82 of this key.

65. Later reduced by Hochreutiner to synonymy under *P. subhastata* (first paragraph 106 of this key) but that species was described as much smaller flowered. It is *P. subhastata* ssp. *paludosa* var. *mollis* f. *patuliloba* (Hochr.) Hassler.

65a. Synonym: *Asterochlaena orbicularis* (Ulbr.) Hassler.

66. Carpels very similar to those of *P. paniculata* Cav. (first paragraph 79 of this key) to which *P. subhastata* apparently is related, differing however in its more elongate, usually subhastate leaves, less paniculate inflorescence, larger flowers, and commonly more numerous bractlets. Hassler (Bull. Herb. Boiss. ser. 2, 7:733–736) published a subsp. *paludosa* with 4 varieties and several forms, from Paraguay, including therein *P. patuliloba* Hochr. (see first paragraph 101) and *P. vitifolia* Hochr. (see second paragraph 107). Specimens from northern Argentina (Formosa, Misiones) are probably referable to Hassler's subsp. *paludosa,* having larger flowers than in *P. paniculata.* They vary greatly in leaf-shape from broadly ovate and not lobed or subapically lobed to narrow and subhastately lobed. The bractlets are few for *P. subhastata* (6–11). There is an isotype of *P. subhastata* ssp. *paludosa* var. *viscosissima* Hassler in the Herbarium of the University of California.

67. Synonym. *P. subhastata* Tr. & Planch. ssp. *paludosa* Hassler var. *eglandulosa* Hassler f. *vitifolia* (Hochr). Hassler. This seems very close to, and is, perhaps, not specifically distinct from *P. opulifolia.*

67a. Synonym: *Asterochlaena Balansae* (Guerke) Hassler.

68. Not sufficiently known. Perhaps not specifically distinct from *P. subhastata,* sensu lat.

69. It is stated in the text of Fl. Bras. (12³:521) "carpella non vidi," but a carpel illustrated in pl. 101, fig. 2, is broadly winged, very much as in *P. Blanchetiana* (first paragraph 119). Guerke distinguished var. *ovata* Guerke with subentire leaves, rounded at base, and var. *cordata* Guerke with dentate, cordate leaves.

70. *P. lanceolata* Colla, of Brazil, if a distinct species, belongs somewhere among paragraphs 116–119. It was described as having subfistulous stems, glabrous herbage (except the peduncles), lanceolate, crenulate, 1-nerved leaves, solitary, axillary flowers (corolla not seen), an involucel of 15–20 linear bractlets, and unarmed carpels.

71. This and the 2 following species are keyed also in Sect. *Typhalaea,* paragraphs 32 and 33.

72. Also keyed in Section *Typhalaea,* second paragraph 18.

73. See Note 63.

THREE NATURALIZED ANNUALS IN YUBA COUNTY, CALIFORNIA. The following field notes concern plants that were found at Timbuctoo, Yuba County, California, in the lower foothills of the Sierra Nevada at an elevation of about 400 feet on June 5, 1957. All are natives in the Old World but promise to become increasingly common in California.

BRACHYPODIUM DISTACHYON (L.) Beauv. The plants of the "false brome" with their stiff brownish racemes of 2 or 3 large spikelets are quite prominent among the other annual grasses which are now largely dried on the slopes about the site of this old mining town. The surrounding Yuba County hills are well populated with this European grass which is becoming increasingly abundant in the northern and central Sierra Nevada foothills.

TRIFOLIUM GLOMERATUM L. Patches of "cluster clover" are growing on brownish-red, gravelly soil, on the edge of the road somewhat southwesterly from the old Stewart & Bros.-Wells Fargo store. The plants, which have prostrate stems, are from two to several inches in diameter and bear small light pink flowers. Many of the plants are dried, some are fruiting, while yet others are green and flowering. In fruit the flowers become brown and somewhat rigid, the sessile heads resembling small pincushions beset with stubby brown "pins." The seeds are very small (1 mm.) and are light green.

This probably is the first known naturalized occurrence of the plant in California, it having been reported only once before to our knowledge in the United States (in Texas according to Shinners, Leafl. West. Bot. 7:132, —1954)*.

CRUCIANELLA ANGUSTIFOLIA L. This plant is growing on a low roadbank, opposite the old Stewart & Bros.-Wells Fargo store in brownish-red, somewhat stony soil. Superficially the inflorescence resembles a grass, particularly some forms of *Phalaris Lemmoni,* but closer examination reveals its affinity to *Rubiaceae,* far from the grasses.—BEECHER CRAMPTON, University of California, Davis.

*A second station for *Trifolium glomeratum* L. in the Sierra Nevada foothills may be recorded here: Coloma, Eldorado County, elevation 850 feet, where the plant was collected on May 16, 1954, my *No. 29644.*—J. T. HOWELL.

PLANTS FROM MOUNT WHITNEY, CALIFORNIA. Due to the scarcity of records of flowering plants in California at the 14,000-foot level, I wish to record the following which I collected at 14,200 feet on Mt. Whitney, July 30, 1954: *Poa Suksdorfii* (Beal) Vasey *(7632), Calyptridium umbellatum* (Torr.) Greene var. *caudiciferum* (Gray) Jeps. *(7633), Draba Lemmonii* Wats. *(7630),* and *D. Breweri* Wats. *(7631). Polemonium eximium* Greene and *Hulsea algida* Gray grew in the vicinity; and a little way down the trail, at about the 13,500-foot level, grew *Carex Helleri* Mkze., *Anelsonia eurycarpa* (Gray) Macbr. & Pays. *(7629),* and *Erigeron vagus* Pays. *(7628).* I do not believe that *Anelsonia* reaches, in this vicinity, the elevation of 14,300 feet attributed to it by Jepson (Fl. Calif. 2: 76), apparently on the basis of a Purpus collection labeled "Mt. Whitney," but, of course, it may.

My collections, indicated by my field numbers in parentheses, are in the Herbarium of the California Academy of Sciences. All were made in Tulare County.—PETER H. RAVEN.

NEAPOLITAN ONION IN CALIFORNIA. The Neapolitan onion, *Allium neapolitanum* Cyr., is an attractive garden plant that tends to become weedy in California gardens and to become naturalized beyond the garden gate. Although some uncultivated occurrences of the plant seem to result from bulbs that have been discarded in refuse from gardens, a few other occurrences appear to indicate plants growing spontaneously under natural conditions. The Neapolitan onion, which is attractively white-flowered, might be confused in California with the much weedier *A. triquetrum* L., but that has a sharply triangular scape, whereas in *A. neapolitanum* the scape is nearly terete.

The following specimens are in the California Academy of Sciences Herbarium: vacant lot, Davis, Yolo Co., *Raven 8278;* trash pile, Sacramento, Sacramento Co., *M. K. Bellue in 1953;* open grassy pasture, 2 miles east of Napa, Napa Co., *Mr. and Mrs. Merrel Ackley in 1956, in 1957;* Rio Nido, Sonoma Co., *N. Boyle in 1941;* spontaneous in garden, Larkspur, Marin Co., *B. Clear in 1958;* garden weed, San Francisco, *Howell 29140;* roadside fugitive from cultivation, Fullerton, Orange Co., *Howell 30921.*—J. T. HOWELL.

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JOHN THOMAS HOWELL

A TENTATIVE KEY TO THE SOUTH AMERICAN SPECIES OF SIDA, L.

BY THOMAS H. KEARNEY (†)

This is an artificial key, and juxtaposition of the species does not necessarily indicate close relationship. Many of the species are imperfectly known, and in such cases published descriptions have been the only source of the characterizations in the key. This is always unsatisfactory because the descriptions often omit characters that have been used as the basis of the divisions of the present key, hence the large number of possible exceptions that are mentioned in parentheses. As far as practicable, however, the diagnoses are based upon examination of herbarium specimens and of photographs of types, when available. Species not known from farther south than Panama are excluded. The notes will be found at the end of the paper. Note 1.

EDITOR'S NOTE. In his monographic "Studies in Sida (Malvaceae)" (Contrib. Gray Herb. No. 180, pp. 4–91, April, 1957), I. D. Clement treats 28 species, 18 of which occur in South America. In the key which we are publishing here, Dr. Kearney uses all names that Clement has employed except three. Whereas Dr. Kearney accepts the name *S. prostrata* Cav. (first paragraph 18 of key) and treats *S. flavescens* Cav. as a synonym (Note 15), Clement (p. 44) does the reverse. Dr. Kearney accepts *S. Hassleri* Hochr. as a species distinct from *S. linifolia* Cav., but Clement treats *S. Hassleri* as a synonym of *S. linifolia* var. *brevis* (Hochr.) Clement (p. 84). With reservations, Dr. Kearney retains *S. quinquenervia* Duchass. in *Sida* (cf. Note 59), while Clement refers the plant to the monotypic genus *Sidastrum* Baker f. (p. 9). Kearney and Clement do not always dispose of nonacceptable names in the same way, but we have not gone through the synonymy in the two treatments to list the discrepancies. Among the names listed as indeterminate by Dr. Kearney in his Note 1, two are disposed of by Clement: *S. graminifolia* Rich. is given as a synonym of *S. linifolia* Cav. var. *linifolia* by Clement (p. 83); and *S. inflata* Larrañaga is given as *S. physocalyx* A. Gray by Clement (pp. 32, 34). *Sida centuriata* Clement, "obviously in close relationship to *S. ciliaris*," is described as a new species from Paraguay (pp. 18–20).

(†) This is the fourth paper dealing with the taxonomy of *Malvaceae* to be published in this journal with aid from the T. H. Kearney Memorial Fund of the California Academy of Sciences.—J. T. HOWELL.

Leaflets of Western Botany, Vol. VIII, pp. 249–272, September 5, 1958.

In his treatment of *Sida* in the Flora of Peru, J. Francis Macbride (Field Museum Bot. Ser. 13, Pt. 3A, No. 2: 573—588, —1956) treats two species not included by Dr. Kearney in the present key: *S. chachapoyensis* Baker f. (p. 576) and *S. grewiifolia* (Ulbr.) Hochr. ex Macbride (p. 578). The former is mentioned by Dr. Kearney in his Note 23; the latter is based on *Abutilothamnus grewiifolius* Ulbr. which Dr. Kearney retained in its monotypic genus (cf. Kearney, Amer. Midl. Nat. 46: 104, 124,—1951). The plant called *S. veronicaefolia* by Macbride (p. 587) is treated as *S. hederaefolia* by Kearney (cf. dichotomy 37 in key).—J. T. Howell.

1. Leaves palmately lobed, usually deeply so. Plants annual (so far as is known); inflorescences paniculate, usually many flowered; petals pink to red-violet; anthers few (5–20); carpels 5–7, aristate (except sometimes in *S. jatrophoides?),* the awns retrorsely hispid. Section Oligandrae. Note 2. (2).

1. Leaves not palmately lobed (9).

2. Staminal column glabrous; anthers 5. Carpels 5 (3).

2. Staminal column pubescent; anthers 10–20 (6).

3. Carpel-awns about 14 mm. long. Peru. .....*S. lomana* Bruns. Note 3

3. Carpel-awns 4–6 mm. long (4).

4. Leaf-lobes oblong, obtuse, scarcely narrowed at base. Peru.....
.....*S. patuliloba* R. E. Fries

4. Leaf-lobes lanceolate or ovate-lanceolate, acute or acutish, narrowed (in *S. lomageiton?)* at base (5).

5. Stipules 5–7 mm. long; leaves cleft to below the middle; calyx subtomentose; carpel-awns 6 mm. long. Ecuador, Peru, and Bolivia....
.....*S. oligandra* K. Schum.

5. Stipules 1.5–2 mm. long; leaves cleft nearly to the middle; calyx sericeous; carpel-awns about 4 mm. long. Peru. .....
.....*S. lomageiton* Ulbr. Note 4

6. Carpels 5, the awns 12–14 mm. long. Anthers 10. Ecuador .....
.....*S. decandra* R. E. Fries. Note 5

6. Carpels 7, the awns 4–5 mm. long (7).

7. Leaves relatively shallowly cleft, the lobes broad at base, triangular; anthers 10–15. Ecuador, Peru, and (?) Brazil....*S. palmata* Cav. Note 6

7. Leaves cleft to below the middle, the lobes narrowed at base (8).

8. Anthers 20; leaf-lobes pinnately incised. Peru .....
.....*S. jatrophoides* L'Hér. Note 7

8. Anthers 10; leaf-lobes irregularly toothed. Peru.....*S. rupo* Ulbr.

9. Peduncle adnate to the petiole of the subtending leaf or bract; flowers in more or less dense, few-flowered apical clusters, as if involucrate by the upper leaves and conspicuous, hirsute-ciliate stipules. Leaves (except in *S. surumuensis)* sparingly serrate toward apex, mostly narrow, often wedge-shaped; carpels 5–8. Section *Pseudomalachra.* (10).

9. Peduncles not so adnate; flowers not in dense terminal clusters or, if so, then not appearing involucrate (13).

10. Leaves tridentate at the broadly truncate apex, cuneate-obovate or oblanceolate. Stems more or less decumbent; petals about 17 mm. long, pinkish-yellow; carpels 5, aristate, rugose-reticulate, conspicuously spinose-muricate on the dorsal angles. Northern Argentina.....
.....*S. paradoxa* Rodrigo

10. Leaves several-toothed in the upper half or two-thirds or nearly entire in *S. surumuensis*. Carpels rugose-reticulate and muricate, shortly and stoutly aristate (11).

11. Stems erect or ascending, sparingly branched; carpels with long, spinose murications. Leaves linear; petals 10–15 mm. long, pink or purple. Brazil, Paraguay, Uruguay, Argentina; North America.....
.....*S. anomala* St. Hil.

11. Stems procumbent to ascending, diffusely branched from the base; carpels with usually short murications (12).

12. Plants suffrutescent from a strong, woody caudex; stems up to 40 cm. long; leaves narrowly linear or linear-lanceolate, acute at apex, the margins entire or nearly so; petals more than 10 mm. long, orange. Brazil (Amazonas) and (?) British Guiana. .*S. surumuensis* Ulbr. Note 8

12. Plants (sometimes annual?) herbaceous or nearly so above the caudex; stems seldom more than 25 cm. long; leaves narrowly oblong to obovate or (rarely) suborbicular, rounded or truncate to acute at apex, the margins serrulate or serrate; petals 6–10 mm. long, pink, purplish, or orange. Almost throughout South America; North America.....
.....*S. ciliaris* L. Note 9

13. Flowers with an involucel of (usually 3) narrowly linear bractlets; herbage silvery-lepidote. Perennial herb with low, decumbent stems; leaves thickish, asymmetric, suborbicular, rather coarsely dentate; flowers solitary in the axils on more or less elongate, often curved peduncles; petals yellow, drying blackish; carpels 6–8, muticous. Section PSEUDOMALVASTRUM. Paraguay, Uruguay, Argentina .....
.....*S. leprosa* (Ortega) K. Schum. Note 10

13. Flowers not involucellate; herbage not silvery-lepidote (14).

14. Calyx becoming greatly enlarged, inflated, membranous, more or less conspicuously veiny, enclosing and much longer than the muticous (sometimes bluntly rostrate) carpels. Plants mostly herbaceous above ground; leaves mostly cordate. Section PHYSALODES. (15).

14. Calyx otherwise, only moderately accrescent. Note 11. (19).

15. Flowers numerous, in rather loose, axillary clusters of 4 or more. Herbage loosely tomentose; stems erect; leaves oblong-ovate to suborbicular, cordate, coarsely crenate-dentate, somewhat discolorous; calyx 7–10 mm. long at maturity; petals salmon-pink; carpels 5, not at all rostrate, smooth-sided. Brazil, Paraguay, Uruguay, Argentina.....
.....*S. urticaefolia* St. Hil. Note 12

15. Flowers few, either solitary in the axils of the stem and branches or rarely 2 in *S. macrodon*, or normally 2, rarely 3 in *S. prostrata* (16).

16. Stems usually creeping and rooting at the nodes, very slender, minutely stellate and with long, simple hairs; leaves very asymmetric, cordate at base, thin, ovate, acute or acuminate at apex, shallowly dentate or crenate; carpels 5, with hyaline lateral walls, smooth or obscurely reticulate, muticous or nearly so. Calyx 5–7 mm. long at maturity, the lobes scarcely cordate; petals yellow or whitish, 6–7 mm. long. Brazil, Argentina; southern Mexico, Central America, and Panama ..... *S. decumbens* St. Hil. & Naud. Note 13

16. Stems not creeping or rooting at the nodes; leaves symmetric or nearly so, thicker; carpels with thicker, firm lateral walls (17).

17. Calyx strongly plicate-angulate, the lobes deeply cordate; carpels 10–14, with coarsely reticulate, firm, lateral walls and a long, horizontal, blunt beak, black at maturity; petals yellow, 10–20 mm. long. Stems more or less decumbent from a long, tuber-like caudex, rather loosely pubescent with mostly few-rayed hairs; leaves symmetric or nearly so, oval, ovate, or suborbicular, coarsely crenate-dentate, usually subcordate at base, rounded to acutish at apex; calyx 10–15 mm. long. Brazil, Paraguay, Uruguay, Argentina; North America..... ..... *S. physocalyx* A. Gray. Note 14

17. Calyx not or but slightly plicate-angulate, the lobes not deeply cordate; carpels fewer, with smooth or smoothish lateral walls and without a long horizontal beak; petals pink or white. Stems finely stellate and with long simple hairs (18).

18. Peduncles much shorter than the subtending leaves; flowers 1–3 in the axils; carpels 5. Brazil, Uruguay, Argentina..*S. prostrata* Cav. Note 15

18. Peduncles mostly longer than the subtending leaves; flowers solitary, rarely binate; carpels about 8. Stems sometimes from a thick, tuber-like root. Brazil, Bolivia, Paraguay, Argentina, Peru..... ..... *S. macrodon* DC. Note 16

19. Inflorescences terminal or subterminal, corymbiform or short-racemose, the small subulate bracts caducous; leaves entire-margined, mostly linear or lanceolate, elongate, sharply attenuate-acuminate, short-petiolate or subsessile. Stipules conspicuous, subulate, rather persistent; calyx campanulate, pilose or villous; petals white or yellow, sometimes with a brown-purple basal spot; carpels muticous or nearly so. Section STENINDA. (20).

19. Inflorescences otherwise or the leaves not entire (21).

20. Plants herbaceous, annual (or sometimes perennial?); stems unbranched or sparingly (seldom freely) branched; leaves linear or narrowly lanceolate; calyx 4–5 mm. long; petals 7–10 mm. long; carpels 7–9. Northern South America to Bolivia, Brazil, and Paraguay; North America ..... *S. linifolia* Juss. ex Cav. Note 17

20. Plants suffrutescent; stems more branched; leaves lanceolate, or the lower ovate-lanceolate or elliptic; calyx about 7 mm. long; petals 11–15 mm. long; carpels fewer. Herbage hirsute with long, pustular-based, simple hairs. Paraguay ..... *S. Hassleri* Hochr.

21. Flowers numerous or many, in open, more or less leafy, terminal panicles, usually long-pedicellate (except in *S. micrantha* and *S. pyra-*

midata). Carpels 7 or fewer. Section THYRSINDA, amplified. Note 18. (22).

21. Flowers relatively few, if many and more or less paniculate *(S. aggregata, S. cordifolia, S. urens)* then short-pedicellate and crowded. Section MALVINDA (26).

22. Petals dark red or purple. Herbage pubescent, usually copiously so, without glandular hairs; leaves ovate or ovate-lanceolate, cordate or rounded at base, crenate or serrate; panicle very open, the filiform pedicels much longer than the flowers; petals 3–5 mm. long, often reflexed; carpels 5, muticous or short-beaked. Northern South America to northern Argentina; North America.....*S. paniculata* L. Note 19

22. Petals (in *S. goyazensis?*) yellow or orange or (in *S. micrantha*) sometimes pink (23).

23. Flowers very small, the petals 2–3 mm. long, not or barely surpassing the calyx; inflorescence an elongate, leafy thyrse with suberect, very many-flowered branchlets. Herbage rather roughly stellate-tomentose; leaves broadly ovate or suborbicular, cordate to truncate at base, up to 12 cm. long; calyx rounded at base, not angulate; carpels 5, short-cuspidate to nearly muticous, puberulent apically. Colombia, Venezuela, Guiana, Brazil; Cuba .....*S. micrantha* St. Hil. Note 20

23. Flowers larger, the petals 5 mm. or longer, surpassing the calyx; inflorescence more open and fewer-flowered (24).

24. Herbage sparsely to copiously pubescent, usually with few or no long and simple, or glandular hairs; leaves shortly and rather abruptly acuminate; carpels 5–8, muticous to cuspidate, thick, the firm lateral walls smooth. Plants suffruticose or shrubby; leaves thin, green, broadly ovate, shallowly cordate or truncate at base, the uppermost leaves reduced to small bracts; inflorescence-branches slender, mostly elongate and more or less racemose or subpaniculate; calyx rounded at base, not angulate; petals 6–8 mm. long, yellow or orange, sometimes red at base. Colombia and Venezuela; North America .....
.....*S. pyramidata* Desportes. Note 21

24. Herbage with long, spreading, simple hairs and copiously glandular-pilose; leaves usually long-acuminate; carpels 5, more or less aristate. Calyx rounded or somewhat angulate (25).

25. Petals about 5 mm. long; carpel-awns slender, antrorsely pilose. Inflorescence-branches rather lax, the flowers rarely solitary in the axils; leaves long-petiolate, ovate, cordate, finely dentate or crenate. Colombia, Venezuela; North America...*S. glutinosa* Commers. Note 22

25. Petals 9 mm. long; carpel-awns retrorsely pilose. Plants perennial, herbaceous or suffrutescent; leaves ovate or oblong-ovate, concolorous; stipules deltoid-ovate, barely 1 mm. long; flowers on long, slender peduncles; carpel-awns very short, curved. Brazil (Goyaz) .....
.....*S. goyazensis* K. Schum.

26. Carpels 5 or occasionally 6 (often so in *S. acrantha* and *S. subcuneata?*). Note 23. (27).

26. Carpels (in *S. galheirensis?)* seldom fewer and often more than 6 (71).

edge. Stems with scattered, long, simple hairs in addition to the more abundant shorter hairs; leaves ovate-lanceolate, shallowly cordate; calyx 8–9 mm. long, puberulent and also with longer, simple hairs on the angles and margins, the lobes sharply attenuate-acuminate; petals about 12 mm. long. Bolivia.....*S. gracilipes* Rusby. Note 32

38. Carpels (in *S. lapaensis?)* otherwise (39).

39. Carpels muticous, truncate or depressed at apex, glandular. Herbage glandular and viscid; flowers somewhat clustered at apex of the branchlets, very fragrant; petals more (?) than 20 mm. long. Brazil (Minas Geraes) .....*S. odorata* Monteiro f. Note 33

39. Carpels (in *S. lapaensis?)* corniculate, cuspidate, or aristate at apex, not glandular. Leaves small, discolorous (40).

40. Plant shrubby; leaves linear-oblong, subcordate, obtuse at apex; petals 10 mm. long, retuse at apex. Calyx tomentellous; mature fruit unknown. Brazil (Minas Geraes).....*S. lapaensis* K. Schum.

40. Plants herbaceous, perennial; leaves ovate, cordate, acutish to subacuminate at apex; petals about 7 mm. long. Carpels cuspidate or very shortly aristate (41).

41. Stem-pubescence of long, fine, spreading, simple hairs only; petals unequally bilobate. Argentina (Tucumán).....*S. Lilloana* Rodrigo

41. Stem-pubescence of short, more or less glandular hairs; petals emarginate. Paraguay .....*S. rupicola* Hassler var. *grandiflora* Hassler

42. Inflorescences mainly terminal, subcapitate or umbelliform, the flowers conspicuously subtended by the stipule-like, reduced upper leaves. Leaves (below the inflorescence) oblanceolate or oblong-obovate, often somewhat rhombic, mostly cuneate or subcuneate at base, serrate or crenate above the middle; calyx-lobes long-acuminate; petals yellow or white with a purple basal spot; carpels (sometimes 6) muticous or nearly so, dehiscent only at apex, with fragile lateral walls (43).

42. Inflorescence otherwise, if terminal, then not conspicuously bracteate with stipule-like bracts, the flowers solitary or clustered in the upper axils (44).

43. Plants herbaceous, perennial; pubescence grayish; leaves rhombic-oblong or -obovate, ¼–½ as wide as long, acute or obtuse at apex, crenate-dentate to about the middle; flowers mostly terminal. Brazil (Minas Geraes) .....*S. acrantha* Link

43. Plants woody; pubescence yellowish; leaves oblong-oblanceolate, about ¼ as wide as long, rounded-truncate at apex, dentate only at or very near the apex; flowers axillary as well as terminal. Brazil (Minas Geraes) .....*S. subcuneata* St. Hil. Note 34

44. Flowers solitary or subracemosely clustered in the axils of the uppermost leaves (45).

44. Flowers more scattered along the stem, solitary or glomerate (46).

45. Leaves linear-lanceolate, about ⅕ as wide as long; flowers mostly solitary, the pedicels 5 mm. or longer; calyx glabrous, the lobes very long-caudate; petals about 5 mm. long, oblong, yellow; carpels muticous. Brazil (Amazonas) .....*S. blepharoprion* Ulbr. Note 35

45. Leaves ovate or elliptic, about ½ as wide as long; flowers mostly in dense clusters, the pedicels not more than 2 mm. long; calyx minutely stellate-pubescent and with long, simple hairs, the lobes subacuminate; petals 7 mm. long, suborbicular, rose-pink; fruit unkown. Brazil (Bahia) ..... *S. Ulei* Ulbr. Note 36

46. Inflorescence (when well developed) composed of dense, subcapitate, several-flowered, axillary and terminal glomerules, these sometimes constituting a leafy panicle, the flowers (except in *S. margaritensis)* subsessile or very shortly pedicellate. Leaves cordate at base; calyx (except sometimes in *S. tomentella?)* hirsute or villous, plicate-angulate; petals (in *S. pseudo-urens?, S. tomentella?)* yellow, sometimes with a red base (47).

46. Inflorescence otherwise (52).

47. Carpels shortly aristate, the awns retrorsely hirsutulous. Stems somewhat woody, black-violet after loss of the pubescence; leaves lanceolate to ovate, about ½ as wide as long, shallowly cordate, attenuate-acuminate at apex; petals 4.5 mm. long, shorter than the calyx; seeds minutely puberulent. Paraguay ....*S. melanocaulon* Hassler. Note 37

47. Carpels muticous to shortly aristate, the awns, when present, antrorsely pilose (48).

48. Calyx about 4 mm. long; stems with reddish, stellate pubescence. Leaves ⅔–¾ as wide as long, acute. Peru...*S. pseudo-urens* Baker f. Note 38

48. Calyx 5–8 mm. long; stems with long, simple, spreading hairs in addition to other pubescence (49).

49. Petals 5 mm. long; plants suffruticose; peduncles up to 4 cm. long; carpels with a somewhat prominent dorsal costa, 3 mm. long. Paraguay .....*S. margaritensis* Hassler. Note 39

49. Petals 6–7 mm. long; plants herbaceous or nearly so; peduncles much shorter; carpels rounded on the back, not prominently costate (50).

50. Stems densely tomentose toward apex with short, stellate hairs, also more sparsely villous with long, very fine, lax, simple hairs; leaves ovate-lanceolate, long-acuminate, serrate or crenate-serrate, discolorous, dark green above, whitish-tomentose beneath; calyx commonly without long hairs; carpels 3 mm. long, apiculate, puberulent. Brazil .....*S. tomentella* Miq. Note 40

50. Stems not tomentose, hirsute or hispid with stiff, simple or few-armed hairs; leaves commonly ovate, acutish to short- (exceptionally long-) acuminate, nearly concolorous; calyx villous or hirsute, especially on the angles and margins; carpels 1.5–2 mm. long, glabrous or nearly so (51).

51. Herbage rather sparsely pubescent; leaves thin, usually short-acuminate, rather coarsely dentate or serrate; lateral glomerules often borne on elongate branchlets. Almost throughout South America; North America .....*S. urens* L. Note 41

51. Herbage densely pubescent with reddish or yellowish hairs; leaves thick, acutish, crenulate-serrulate; lateral glomerules sessile in the axils or nearly so. Venezuela, Bolivia, Brazil, and (?) Paraguay .....
.....*S. rufescens* St. Hil. Note 42

52. Leaves linear or linear-lanceolate, not more than 1/5 as wide as long, subcordate-subauriculate at base, acute, serrulate above the middle; petals white with a dark purple basal spot, about 11 mm. long. Plants herbaceous; stipules up to 12 mm. long, persistent after the leaves fall; carpels 2–2.5 mm. long, obovoid-trigonous, thick, muticous or slightly apiculate, reticulate and minutely pitted, thin-walled, glabrous. Brazil ..... *S. linearifolia* St. Hil.

52. Leaves broader, or the petals yellow, or, if white, then without a basal spot (53).

53. Corollas white or whitish; carpels opening irregularly below by a whitish membrane. Stems minutely stellate-pubescent; leaves broadly ovate to lanceolate, serrate, rounded to subcordate at base; flowers solitary in the axils but becoming racemosely crowded at apex; peduncles much shorter than the subtending leaves; calyx 5-angulate, the lobes acute. West Indies and "tropical continental America"..... ..... *S. alba* L. Note 43

53. Corollas normally yellow in most of the species (paragraphs 54–70); carpels commonly opening regularly at apex (54).

54. Carpels muticous, obovoid-trigonous, rounded or depressed at apex. Herbage more or less glandular-puberulent, the stems also with long, spreading, simple hairs; leaves lanceolate to ovate; flowers axillary, solitary or in very few-flowered loose clusters, often rather long-pedunculate; calyx glandular-puberulent and hirsute; petals about 6 mm. long, shorter than the calyx, yellow (55).

54. Carpels corniculate, cuspidate, or aristate at apex (56).

55. Lateral walls of the carpels smooth, very thin and fragile. Brazil and (?) Paraguay ..... *S. aurantiaca* St. Hil.

55. Lateral walls of the carpels rugulose, firm. Venezuela, Brazil, Colombia(?), Paraguay (?)..... *S. Martiana* St. Hil. Note 44

56. Peduncles (except sometimes in *S. spinosa)* very short. Leaves rounded, truncate, or subcuneate at base (rarely obscurely cordate); carpels normally more or less aristate, the awns and apex of the carpel-body pilosulous with antrorse or spreading hairs (57).

56. Peduncles (in *S. Emilei?)* elongate, usually very slender (60).

57. Herbage finely soft-tomentose; stems herbaceous or somewhat woody, often decumbent, without infrapetiolar tubercles; leaves oblong or subrhombic to suborbicular, rounded or obtuse at apex, nearly concolorous; corolla whitish, buff, or pale yellow. Northern South America; West Indies, southern Mexico (?), Panama..... ..... *S. jamaicensis* L. Note 45

57. Herbage minutely stellate-puberulent; stems herbaceous, erect, often with more or less spinose infrapetiolar tubercles; leaves ovate or oblong to narrowly lanceolate, obtuse or acutish at apex, usually discolorous; petals normally yellow (58).

58. Leaves ovate, ovate-lanceolate, or oblong, 1/2–2/3 as wide as long. Almost throughout South America; North America..... ..... *S. spinosa* L. var. *spinosa*. Note 46

58. Leaves (except sometimes in var. *Riedelii)* linear or lanceolate, not more than ¼ as wide as long (59).

59. Flowers commonly only 1 or 2 in the axil, sometimes with an accessory branchlet; carpel-awns erect. Almost throughout South America.. .....*S. spinosa* var. *angustifolia* (Lam.) Griseb. Note 47

59. Flowers commonly several in the axil, in dense glomerules; carpel-awns divergent. Brazil, Paraguay, Argentina..... .....*S. spinosa* var. *Riedelii* (K. Schum.) Rodrigo. Note 48

60. Leaf-base not cordate, either truncate or cuneate (61).

60. Leaf-base more or less deeply cordate (63).

61. Leaves less than 2 cm. long, linear, truncate at apex, serrulate, discolorous; calyx 3–3.5 mm. long, longer than the corolla. Herbage minutely stellate-puberulent; stems profusely branched; carpels about 2 mm. long, rugose-reticulate on the sides, mucronate. Colombia.... .....*S. Killipii* Kearney. Note 49

61. Leaves mostly more than 2 cm. long, broader than linear, acuminate at apex, irregularly serrate; flowers larger, the corolla 5 mm. or longer. Carpels shortly beaked (62).

62. Blades rhombic-lanceolate, strongly cuneate and subhastate at base, coarsely toothed. Peru? .....*S. Ruizii* Ulbr. Note 50

62. Blades ovate-lanceolate or ovate-oblong, truncate at base. Flowers nutant; carpels with thin, fragile, obscurely veined lateral walls. Brazil (Minas Geraes) .....*S. chapadensis* K. Schum.

63. Stems (or lateral branches) prostrate and often rooting at the nodes, very slender, often nearly filiform. Leaves nearly or quite as long as wide; carpels more or less aristate with antrorsely (sometimes retrorsely?) scabrous or pilose awns, the body 2–2.5 mm. long. Colombia, Peru, Galápagos Islands; West Indias, Old World Tropics.... .....*S. hederaefolia* Cav. Note 51

63. Stems decumbent to erect, not rooting at the nodes (64).

64. Carpels muticous or merely corniculate at apex. Leaves broadly ovate or subtrilobate (65).

64. Carpels more or less aristate (66).

65. Herbage and calyx entirely glabrous except that the young stems are sparsely glandular and hirsute; lateral walls of the carpel very thin, reticulate. Brazil (Ceará) .....*S. cearensis* Ulbr. Note 52

65. Herbage and calyx copiously pubescent with short glandular and eglandular, and with long, simple hairs; lateral walls of the carpels covered with sessile, fetid glands. Bolivia, Brazil, Argentina..... .....*S. piauhyensis* Ulbr. Note 53

66. Petals 9–10 mm. long; carpels 1.5 mm. long, including the awns. Plants perennial, herbaceous, with subscandent, flexuous stems; leaves nearly concolorous, triangular-lanceolate or oblong-ovate, 2.5–6 cm. long; flowers solitary in the axils, long-pedunculate; calyx with minute hairs on ribs and margins, otherwise glabrous. Paraguay..... .....*S. gracillima* Hassler. Note 54

66. Petals (in *S. Emilei?)* not more than 7 mm. long; carpels larger (67).

67. Carpels 2-lobed at apex, the lobes deltoid or quadrate and terminating in awns, the carpel-body below the smooth lobes usually finely reticulate (68).

67. Carpels (in *S. Emilei?*) otherwise (70).

68. Stems decumbent, herbaceous or nearly so above the caudex, with long, fine, simple hairs in addition to shorter pubescence; carpel-body 2.5–4.5 mm. long, narrow, the awns rather long, antrorsely pilose. Uruguay, Argentina ..... *S. dictyocarpa* Griseb.

68. Stems erect or ascending (69).

69. Carpels as in *S. dictyocarpa* but with shorter awns; stems more or less woody above the caudex, up to 1 m. high, minutely puberulent, without long hairs. Argentina, Bolivia, and (?) Paraguay ..... *S. esperanzae* R. E. Fries. Note 55

69. Carpels rounded-trigonous, 2.5 mm. high, short-awned; stems herbaceous or nearly so, with long hairs in addition to other pubescence. Paraguay ..... *S. rupicola* Hassler. Note 56

70. Peduncles articulated toward the base; stems densely pubescent toward apex; leaves velutinous on both surfaces, obtuse or acute at apex. Flowers solitary in the axils; petals (even the claws) entirely glabrous; mature fruit unknown. Paraguay ..... *S. Emilei* Hochr. Note 57

70. Peduncles articulated at or above the middle; stems not densely pubescent; leaves not velutinous, attenuate-acuminate. Stems glabrate to copiously but not densely pubescent with mostly simple, often somewhat glandular hairs; leaves sparsely pubescent, thin, ovate or ovate-lanceolate, cordate, serrate-dentate; inflorescence, when well developed, forming an open, leafy, relatively few-flowered panicle, the peduncles up to 4 cm. long; petals about 6 mm. long; carpels narrow, usually finely reticulate, pilose toward apex, with (often very long) antrosely pilosulous awns. Mexico and West Indies to northern South America ..... *S. glabra* Mill. Note 58

71. Inflorescence mainly terminal and spike-like, the flowers nearly sessile and closely subtended (falsely involucellate) by several subulate, hispid bracts, these much longer than the calyx. Plant herbaceous; stems hispid; leaves lanceolate, ovate-lanceolate, or ovate-oblong, acuminate; calyx 6–7 mm. long, with acute lobes, shorter than the yellow petals; carpels 7–10, dehiscent to the base dorsally. Guiana, Brazil; Panama ..... *S. quinquenervia* Duchass. Note 59

71. Inflorescence not spike-like or the flowers not subtended as above (72).

72. Blades of the leaves more or less acutely lobed. Stems erect, scurfy or white-tomentose; blades ovate, cordate at base, acuminate at apex, irregularly serrate, discolorous, white-tomentose beneath, up to 10 cm. long; flowers glomerate at apex of the long peduncles; petals 12–16 mm. long, much longer than the calyx; carpels 12–15, cuspidate. Ecuador ..... *S. Jamesonii* Baker f.

72. Blades not lobed or very shallowly so. Note 60. (73).

73. Leaves distichous, shortly petiolate or subsessile, often more or less rhombic, rounded to cuneate and more or less asymmetric at base. Stipules conspicuous, persistent, prominently 3-nerved; pedicels very short; carpels usually more than 7, cuspidate or aristate (74).

73. Leaves not distichous (75).

74. Herbage (except in var. *hispida* K. Schum.) not conspicuously pubescent, often glabrate; leaves narrowly lanceolate to ovate, up to 8.5 cm. long; flowers solitary or in small, short-pedunculate, axillary glomerules; petals yellow or whitish, from little-surpassing to about twice as long as the calyx; carpels cuspidate or short-aristate. Almost throughout South America; North America; Old World...*S. acuta* Burm. Note 61

74. Herbage copiously hirsute with simple and stellate hairs; leaves elliptic-lanceolate, up to 14 cm. long, coarsely serrate, long-acuminate; flowers mostly in dense, many-flowered clusters at the ends of axillary branchlets; petals light purple, scarcely surpassing the calyx; carpels long-aristate. Bolivia .....*S. Bakeriana* Rusby. Note 62

75. Carpels aristate, the awns retrorsely hispid or pilose (76).

75. Carpels not aristate, or the awns not retrorsely pubescent (84).

76. Leaves mostly linear to oblong-lanceolate and less than ½ as wide as long (77).

76. Leaves mostly oblong, ovate, or suborbicular, at least the lower ones nearly ½ to quite as wide as long (80).

77. Petals 13–14 mm. long, at least twice as long as the calyx, yellow; leaves very narrow, not more than ⅛ as wide as long, acute at base, up to 6 cm. long, short-petiolate. Flowers loosely subcorymbose or racemose at apex of the stem and branches; stems tomentulous or puberulent above; carpels with rather long, divergent awns. Brazil. .....
.....*S. angustissima* St. Hil.

77. Petals not more than 10 mm. long; leaves (in *S. Allemanii?)* mostly broader, truncate or rounded (rarely subcordate) at base (78).

78. Stems minutely canescent, very rarely with long, simple hairs; leaves denticulate or serrulate, mostly linear or narrowly oblong, rounded or subcuneate at base; calyx angulate-turbinate; petals whitish or cream-colored, brownish at base or pink-veined. Flowers solitary in the axils, somewhat crowded apically; carpels 6–8, narrow, conspicuously muricate, the awns nearly or quite equaling or (in var. *submutica)* much shorter than the body. Colombia, Venezuela, Ecuador; North America; var. *submutica* in the Galápagos Islands and (?) Peru...
.....*S. salviaefolia* Presl

78. Stems with long, simple, spreading hairs in addition to much shorter stellate and glandular hairs; leaves crenate or serrate; calyx (in *S. Allemanii?)* more or less campanulate; petals (in *S. Allemanii?)* pink (79).

79. Petioles geniculate at apex; lowest teeth of the leaves not spreading. Northeastern Brazil .....*S. Allemanii* Monteiro f. Note 63

79. Petioles straight, not geniculate; lowest teeth of the leaves spreading. Plants herbaceous or suffrutescent; stems rarely aculeate (Note 64); flowers solitary in the upper axils and aggregated at apex of the stems; lower leaves sometimes ovate; peduncles articulated shortly below the calyx; carpels 9–13, the awns slender, as long as the body or, in var. *manresana* (Note 65) considerably shorter. Brazil, Paraguay, Uruguay, northern Argentina .....
.....*S. pseudo-potentilloides* Monteiro f. Note 66

80. Stems pubescent with short, glandular hairs; petioles as long or longer than the blades; flowers all solitary in the axils. Plants herbaceous, perennial; leaf-blades suborbicular or oblong, up to 2 cm. long; calyx campanulate; petals 15 mm. long, rose; carpels 10 or 11, long-awned, deeply reticulate below. Northwestern Argentina ..... *S. calchaquiensis* Rodrigo

80. Stems otherwise pubescent, the glandular hairs few or none; petioles shorter (usually much shorter) than the blades; flowers solitary or clustered in the axils and more or less crowded at apex of the stem and branches (81).

81. Flowers very numerous, in dense, axillary and terminal, corymbose or subracemose clusters, the whole inflorescence more or less paniculate. Herbage velutinous with rather long, fine hairs, often rather loosely so, usually without very long, stiff, spreading hairs; leaves ovate to suborbicular, ½ to nearly as wide as long, cordate or truncate at the broad base, conspicuously dentate or serrate; calyx plicate-angulate, the lobes broad, subcordate; petals 10–12 mm. long, commonly yellow; carpels 7–12, prominently reticulate, the awns elongate and retrorsely hispid, or short and the hairs not retrorse. Almost throughout South America; North America ..... *S. cordifolia* L. Note 67

81. Flowers not very numerous, 1 or 2 in the axils and more or less aggregated at apex (82).

82. Stems without long, simple hairs, whitish- or yellowish-lanate; calyx angulate, spreading in fruit, tomentose, the lobes caudate. Leaves rhombic or oblong (to orbicular?), rather coarsely crenate-serrate; petals about 12 mm. long, suborbicular, yellow (?); carpels about 10. Northeastern Brazil..... *S. galheirensis* Ulbr. Note 68

82. Stems (except sometimes in *S. campestris?)* with long, spreading, simple hairs in addition to other pubescence; calyx broadly campanulate, the lobes acuminate. Carpels prominently rugose below (83).

83. Plants perennial and suffrutescent, but flowering the first season; calyx about 10 mm. long, villous with spreading hairs; corolla reddish-yellow; carpels about 12, long-ciliate on the margins of the dehiscent section. Uruguay, Argentina.... *S. variegata* (Griseb.) Krapov. Note 69

83. Plants annual; calyx 5 mm. long, pilosulous; corolla (fide Svenson) white with a red center; carpels 6–10, the dehiscent section not ciliate. Upper leaves sometimes narrowly lanceolate. Ecuador ..... *S. campestris* Benth.

84. Carpels (except sometimes in *S. rhombifolia)* distinctly aristate but the awns not retrorsely pilose (85).

84. Carpels not aristate, muticous to cuspidate or (in *S. Glaziovii)* sometimes minutely aristate (90).

85. Leaves linear or narrowly lanceolate or oblong, 1/6–¼ (⅓) as wide as long, discolorous; flowers mostly in small, terminal, subcorymbose clusters. Plants suffrutescent; petals emarginate or unequally bilobate, very asymmetric; carpels about 10, with a broad, more or less reticulate basal section; the awns shorter than the body (86).

85. Leaves (at least the lower ones) broader, ⅓ or more as wide as long or, if less than ⅓ *(S. rhombifolia)* then more or less rhombic and the flowers more scattered (87).

86. Stems with long, spreading, simple hairs in addition to other pubescence; leaves truncate or subcordate at base, crenate; peduncles articulated; petals 15–18 mm. long, yellow. Southern Brazil (?), Paraguay, northern Argentina ..... *S. vespertina* Ekman

86. Stems without long hairs, minutely puberulent; leaves subcuneate at base, sharply serrate; peduncles not articulated; petals not more than 10 mm. long, yellow or (fide Ekman) when fresh, violet with a yellow base. Southern Brazil, northern Argentina ..... *S. potentilloides* St. Hil. Note 70

87. Petals rose-colored, 10–15 mm. long. Stems shortly stellate-pubescent, also villous, and with sessile glands; flowers solitary (or few?) in the upper axils, aggregated at end of the stem, the peduncles articulated; leaves linear or oblong, rather thick, truncate at base, crenate throughout; calyx 8–12 mm. long. Carpel-awns antrorsely pilose. Paraguay, Uruguay, and (?) northern Argentina..... *S. multicrena* Hochr. Note 71

87. Petals (in *S. santaremensis?)* prevailingly yellow, sometimes whitish or tinged with pink, not more than 12 mm. long; calyx smaller (88).

88. Leaves ½ to very nearly as wide as long, ovate to suborbicular; herbage velutinous. Carpels with short awns, these with spreading, stellate and simple hairs. Northern Argentina ..... *S. cordifolia* var. *breviaristata* Monteiro f.

88. Leaves usually less than ½ as wide as long (89).

89. Leaves normally more or less rhombic and cuneate at base, lanceolate to ovate or obovate; carpels commonly longer than wide. Plants often suffrutescent to shrubby; herbage seldom conspicuously pubescent; infrapetiolar tubercles sometimes present; stipules more or less persistent; flowers solitary or few in the axils, or more or less clustered apically, the peduncles short or elongate; carpels mostly 10–14, with long, glabrous or minutely pilosulous awns, or sometimes nearly muticous. Almost throughout South America; North America; Old World..... *S. rhombifolia* L. Note 72

89. Leaves not rhombic, not (?) cuneate at base, elliptic, oval, or suborbicular; carpels wider than long. Small infrapetiolar tubercles present; carpel-awns 1 mm. or longer. Northern Argentina ..... *S. santaremensis* Monteiro f. var. *Krapovickasiana* Monteiro f.

90. Inflorescence of few-flowered, axillary, short-peduncled, subumbellate or subracemose clusters, the flowers seldom solitary in the axils, flowers very small, the calyx barely 5 mm. long, rounded-campanulate, not at all angulate, the petals little, if any, longer. Plants shrubby or suffruticose; herbage stellate-tomentose; leaves short-petiolate, ovate to lanceolate, often subrhombic, cuneate, rounded, or subcordate at base, obtuse to subacuminate at apex, rather finely crenate or dentate; calyx densely tomentose, the lobes acutish; petals pink with a dark basal spot (or yellow turning red?); carpels about 10, muticous

or mucronate, with thin, finely reticulate lateral walls. Venezuela, Brazil, Paraguay, Argentina; West Indies ...*S. acuminata* DC. Note 73

90. Inflorescence otherwise, or the flowers larger, or the calyx more or less angulate (91).

91. Petals purple, pink, or white drying pink or (in *S. purpurascens?)* exceptionally yellow (92).

91. Petals (in *S. santaremensis?, S. tuberculata?)* normally yellow or orange, sometimes drying pink (97).

92. Stems decumbent or procumbent; leaves about as wide as long, up to 2.5 cm. long, rather long-petiolate, subcordate or subtruncate at base, coarsely crenate-dentate. Stems with long, spreading hairs in addition to other pubescence; flowers solitary in the axils, the peduncles long (often longer than the subtending leaves), slender; petals about 15 mm. long, white or pink, rather deeply emarginate, slightly asymmetric; carpels 10, muticous, with fragile lateral walls. Paraguay.. .....*S. pseudocymbalaria* (Hassler) Hassler. Note 74

92. Stems erect or ascending; leaves longer than wide (93).

93. Leaves usually less than ⅓ as wide as long, oblong or lanceolate, rather long-petiolate; stems (except sometimes in *S. Weberbaueri)* with long, simple hairs in addition to other pubescence. Carpels muticous or slightly apiculate (94).

93. Leaves ⅓–⅔ as wide as long; stems without long hairs (95).

94. Carpels 11–13, the indehiscent (basal) portion strongly reticulate; petals rose-violet; leaves narrowly oblong or oblong-lanceolate, rounded or subcordate at base. Southern Brazil, northern Argentina ....*S. Regnellii* R. E. Fries

94. Carpels 6 or 7, muticous, with 2 short, thick, obtuse beaks, the indehiscent portion very rugose with about 4 elevated, oblique or transverse ridges; petals white or lilac with pink or purple bases and (or) veins; leaves lanceolate, subrhombic, more or less cuneate at base. Peru .....*S. Weberbaueri* Ulbr.

95. Petals about 20 mm. long, pale lilac; carpels (about 15?), subangulate at apex; stipules linear-lanceolate. A shrub, up to 3 m. high; stems pulverulent, tomentose; leaves ovate, about ½ as wide as long, denticulate-serrulate, sometimes shallowly 3-lobed, rounded or subcordate at base, acuminate; flowers cymosely clustered at apex of the stem and branches. Peru ....*S. pulverulenta* (Ulbr.) Kearney. Note 75

95. Petals less than 15 mm. long; carpels 7–9, muticous, glabrous; stipules filiform or nearly so (96).

96. Peduncles elongate, sometimes surpassing the subtending leaves, very slender; leaves elliptic or somewhat rhombic, more or less cuneate at base, obtuse or acutish at apex, serrate, ⅓–½ as wide as long; petals white, drying pink. Southern Brazil, Paraguay..... .....*S. adscendens* St. Hil. Note 76

96. Peduncles much shorter than the leaves; leaves ovate or ovate-lanceolate, rounded, truncate, or cordate at base, acuminate at apex, irregularly crenate or serrate, ½–⅔ as wide as long; petals pink or pale purple (sometimes yellow?). Carpels smooth or nearly so, the walls fragile. Brazil .....*S. purpurascens* Salzm. ex K. Schum. Note 77

97. Inflorescence mostly of loose, few-flowered clusters on often elongate axillary branchlets but some of the flowers also solitary in the axils; carpels (10 or more) obliquely cuspidate or aristulate, the basal section strongly reticulate, much wider than the smooth apical section. Plants herbaceous or suffrutescent; stems erect, sparsely to copiously stellate-tomentose or tomentulous, with inconspicuous infrapetiolar tubercles; leaves broadly ovate to ovate-lanceolate, often somewhat rhombic, subcuneate or truncate at base, crenate or serrate; calyx-lobes deltoid, acute or mucronate; petals about 10 mm. long, yellow (exceptionally white?). Brazil, Paraguay, Argentina .....
.....*S. Glaziovii* K. Schum. Note 78

97. Inflorescence (in *S. santaremensis?)* otherwise; carpels muticous to corniculate (98).

98. Carpel-apex corniculate, the horns rather long and broad; leaves orbicular to elliptic, not rhombic. Petals about 10 mm. long; carpels (9?) 10–14. Brazil and northern Argentina .....
.....*S. santaremensis* Monteiro f. Note 79

98. Carpel-apex muticous or apiculate or, if corniculate (in *S. tobatiensis),* then the horns much narrower (99).

99. Stems with numerous long, simple hairs and subtomentose with short, stellate hairs; leaves oval to suborbicular, subcordate or truncate at base, corolla about 20 mm. long, yellow drying pink. Flowers solitary, rather long-pedunculate; carpels 10, dehiscent dorsally, the lateral walls very thin and fragile. Brazil (Minas Geraes).....
.....*S. rubifolia* St. Hil. Note 80

99. Stems without long, simple hairs, stellate-tomentose or tomentulous; leaves narrower; corolla smaller (100).

100. Leaves up to 2 cm. long, oblong, about ⅓ as wide as long, truncate at base, the margin of the lower ⅓ entire; calyx about 5 mm. long, minutely puberulent. Stems woody, with infrapetiolar tubercles; flowers solitary in the axils, the petals not described; carpels 6 or 7, the mature fruit unknown. Brazil (Minas Geraes) .....
.....*S. tuberculata* R. E. Fries. Note 81

100. Leaves up to 5 cm. long, not more than ¼ as wide as long (except sometimes in *S. urosepala),* rounded to subcordate at base; calyx 8–10 mm. long (101).

101. Petals about 15 mm. long, pale orange, entirely glabrous; calyx yellowish-tomentulous, the lobes acute; floral leaves much reduced, the inflorescence appearing subracemose; leaves linear or linear-lanceolate, 1/6–⅕ as wide as long; carpels about 12, minutely curved-corniculate at apex. Paraguay.....*S. tobatiensis* Ulbr. Note 82

101. Petals about 10 mm. long, bright yellow with a dark base, drying pink, ciliate at base; calyx hirsute with long, simple hairs, the lobes rather abruptly caudate-acuminate; floral leaves not (?) greatly reduced, the flowers subcorymbosely aggregated toward apex; leaves narrowly oblong, ¼–⅓ as wide as long; carpels 7, slightly 2-lobed at apex. Brazil (São Paulo) .....*S. urosepala* R. E. Fries. Note 83

NOTES

1. The following taxa, some of which probably do not belong to the genus *Sida* as now restricted, are insufficiently known for inclusion in this key: *S. amoena* Desf. (Brazil), *S. angulata* Vell. (Brazil), *S. betulaefolia* Schrank (Brazil), *S. brasiliensis* Cav. (Brazil), *S. chacoensis* Hassler (Paraguay, *nom. nud.?*), *S. compressicaulis* Larrañaga (Brazil), *S. echinata* Willd. (Ecuador), *S. graminifolia* Rich. (Guiana), *S. hirticarpa* Larrañaga (Uruguay), *S. inflata* Larrañaga (Uruguay), *S. Luschnathiana* Steud. (Brazil), *S. micrantha* Schrank non St. Hil. (Brazil), *S. Miqueliana* Turcz. (Brazil), *S. myriantha* Planch. & Lind. (Colombia, Brazil), *S. nemorensis* Mart. ex Colla (Brazil), *S. ovalis* Kostel. (Peru), *S. Pohliana* Presl (Peru), *S. radiciflora* Presl (Ecuador), *S. rhombiformis* Larrañaga (Uruguay), *S. ribifolia* St. Hil. (Brazil), *S. Rojasii* Lév. non Hassler (Argentina), *S. semidentata* St. Hil. & Naud. (Brazil), *S. setosa* Mart. ex Colla (Brazil), *S. suborbicularis* St. Hil. & Naud. (Brazil), *S. tomentosa* Mart. ex Colla non Cav. (Brazil), *S. villosa* Mill. (South America), *S. viscidula* Klotzsch (Brazil?). *Sida Tulla* Ulbr. is excluded (see Leafl. West. Bot. 7:121).

2. Paragraphs 2 to 8, inclusive, were taken from R. E. Fries' treatment of this section (K. Sv. Vet. Akad. Handl. ser. 3, 242:14–19).

3. The petals of *S. lomana* were described as probably ochroleucous.

4. Perhaps not specifically distinct from *S. oligandra*.

5. Fries thought this very near *S. lomana*.

6. Synonym: *S. ricinoides* L'Hér. Contrary to the statement by Schumann (Fl. Bras. 123:322), a specimen from Prov. Chimborazo, Ecuador *(W. H. Camp E2999)* has the stems and petioles hirsute with very long, spreading, simple hairs.

7. Synonyms: *S. palmata* Cav. (Diss. p. 274, not p. 20) and of Jacq.

8. Very close to *S. anomala* St. Hil.

9. Synonyms: see Key to the North American Species, Leafl. West. Bot. 7:148, Note 3.

10. Synonyms: *S. sulphurea* (Gill.) A. Gray.

11. *S. pseudocymbalaria* (Hassler) Hassler, with strongly connivent calyx-lobes, might be sought here, but the calyx is only moderately accrescent (see first paragraph 92).

12. Synonyms: *S. flavescens* K. Schum. non Cav. (fide Rodrigo).

13. Synonyms: *S. stolonifera* Salzm., *Anoda decumbens* Hochr. (See also Key to the North American Species, Leafl. West. Bot. 7:148, Note 11.) This species was included by Rodrigo in Section *Physalodes* but Monteiro f. placed it in his *Malvinda-Pentacocca* Section *Decumbentae*.

14. Synonym: *S. hastata* St. Hil. non Willd.

15. Synonyms: *S. flavescens* Cav., *S. intermedia* St. Hil. This species apparently intergrades with *S. urticaefolia* (first paragraph 15).

16. Synonyms: *S. physaloides* Presl and (doubtfully) *S. cymbalaria* Hochr. The latter, from Paraguay, was described as suffrutescent, with white-tomentose young branches and sessile glands on the petioles. It was reduced by Hassler to a variety of *S. macrodon*. The photograph of the type at

Chicago Museum shows, however, that, as compared with the type of *S. macrodon,* the leaves are more elongate (ovate), symmetric, more shallowly dentate, and strongly discolorous.

17. Synonyms: *S. angustissima* Miq. non St. Hil., *S. campi* Vell., *S. viminea* Fisch., and (doubtfully) *S. Fiebrigii* Ulbr. The last, from Paraguay, has the lower leaves oblong or oblong-lanceolate and was described as having the petals dark red toward the base. It may be at least varietally distinct.

18. *S. glabra* Mill. (second paragraph 70) might be sought here, but the flowers, although sometimes in an open leafy panicle and long-pedicellate, are relatively few.

19. Synonyms: see Key to the North American Species, Leafl. West. Bot. 7:148, Note 14.

20. Synonyms: see Key to the North American Species, ibid., p. 148, Note 18.

21. Synonyms: see Key to the North American Species, ibid., p. 148, Note 16. *S. capituliflora* Colla, from Brazil, was described as differing from *S. dumosa (S. pyramidata)* in having merely acutish leaves, more pubescent herbage, and a more capitate inflorescence.

22. Synonyms: see Key to the North American Species, ibid., p. 148, Note 15.

23. The following 5-carpellary taxa were too inadequately described for inclusion in this key: *S. Bradei* Baker f. (Brazil), *S. chachapoyensis* Baker f. (Peru), *S. obsita* Mart. ex Colla (Brazil). Monteiro f. thought that the first might be a synonym of *S. viarum* St. Hil. but, as described, it has broader leaves, shorter petioles and peduncles, a larger calyx (about 8 mm. high), and apparently no long hairs.

24. Synonyms: *S. mollis* Rich. non Ortega and (doubtfully) *S. viridis* St. Hil. & Naud.

25. Synonyms: *S. savannarum* K. Schum. and (doubtfully) *S. pilifera* Klotzsch. The latter name may never have been published as it is not in Index Kew. and Fl. Bras.

26. Considered by Ulbrich to be related to *S. Weberbaueri* (second paragraph 94) but he described the latter as having the fruit usually 7-merous.

27. Synonyms: *S. abscissa* Willd., *S. serrata* var. *abscissa* (Willd.) K. Schum.

28. Ulbrich thought this species related to *S. spinosa.* The relationship seems closer to *S. serrata.*

29. Synonym (fide Rodrigo): *S. argentina* var. *paraguayensis* Ulbr.

30. Synonyms: see Key to the North American Species, Leafl. West. Bot. 7:149, Note 22.

31. Synonyms: *S. Dombeyana* DC., *S. repens* Dombey ex Cav., *S. veronicifolia* var. *hederifolia* K. Schum. This species seems closely related to the Old World *S. veronicaefolia* Lam., but in the latter the carpels are commonly muticous.

32. The peculiar carpels are somewhat like those of *S. dictyocarpa* Griseb. (first paragraph 68). Rusby described the corolla as "slightly exceeding the calyx" and "light purple," but in the type collection, it is 1.5 times as long as the calyx and appears orange-yellow.

33. Stated by Monteiro f. to be related to *S. aurantiaca* var. *fragrantissima* K. Schum., which was described in Fl. Bras. as having erect, strict, virgate stems and small linear or subovate-lanceolate, minutely crenulate, often obtuse, inconspicuously 3-nerved leaves.

34. Paragraphs 43 are based on comparison of photographs of the types of *S. acrantha* and *S. subcuneata*. They certainly appear specifically distinct. Monteiro f. published the combination *S. subcuneata* var. *acrantha* but *S. acrantha* is the older name.

35. Ulbrich thought this species related to *S. linifolia*, but he described the leaves as regularly and acutely serrate.

36. Ulbrich did not state the number of carpels, but as he thought this species related to *S. tomentella* Miq., the number is presumably 5.

37. Very similar in appearance to *S. tomentella* Miq. (first paragraph 50).

38. Too imperfectly described for certain identification.

39. Doubtfully distinct from *S. urens* or *S. tomentella*.

40. Perhaps a synonym of *S. caudata* St. Hil. & Naud., an older name.

41. Synonyms: see Key to the North American Species, Leafl. West. Bot. 7:149, Note 24.

42. The above characterization is based upon two specimens in the U. S. National Herbarium which correspond rather well with St. Hilaire's description. These are from Venezuela (*L. H. Bailey 99*) and Bolivia (*Bang 2807*). Synonyms: *S. urens* var. *rufescens* (St. Hil.) Baker f. and, probably *S. urens* var. *aurea* Hassler, described from Paraguay.

43. See Fl. Jamaica 5[3]:114. This species is poorly understood. In Fl. Bras. and Index Kew., *S. alba* is cited as a synonym of *S. spinosa* L. which, however, has apically dehiscent carpels.

44. Including var. *viscosissima* St. Hil. (A. Juss.?). In Fl. Bras. *S. Martiana* was cited as a synonym of *S. aurantiaca*. Monteiro f. (Lilloa 17:504) recognized both as species and the carpel-characters in paragraphs 55 are taken from his key.

45. Synonyms: see Key to the North American Species, Leafl. West. Bot. 7:149, Note 28.

46. Synonyms: see Key to the North American Species, ibid., Note 29.

47. Basonym: *S. angustifolia* Lam.

48. Basonym: *S. Riedelii* K. Schum. It may be specifically distinct from *S. spinosa*.

49. Synonym: *S. ramosissima* Killip & Cuatrecasas non (Presl) D. Dietr.

50. Very imperfectly known, being based on a single old specimen showing only the top of the plant.

51. Synonym: see Note 31.

52. Ulbrich thought this related to *S. decumbens* St. Hil. & Naud. (see first paragraph 16), but the photograph of the type indicates a very different plant from either *S. decumbens* or from *S. veronicaefolia*, of which Monteiro f. suggested that it might be a variety.

53. Ulbrich considered the relationship to be with *S. goyazensis* (see second paragraph 25) but Monteiro f. thought it near *S. veronicaefolia*. Com-

parison of photographs of the types shows it to be very similar to *S. cearensis* and perhaps not specifically distinct.

54. Hassler compared this species with *S. veronicaefolia.*

55. Synonym: *S. dictyocarpa* var. *esperanzae* (R. E. Fries) Rodrigo and perhaps not more than varietally distinct.

56. Related to *S. glutinosa* Cav., fide Hassler. This also is doubtfully distinct, as a species, from *S. dictyocarpa.* See also second paragraph 41.

57. Characters from Hochreutiner (Ann. Genève 20:138) who compared it with *S. decumbens* St. Hil. & Naud.

58. Synonyms: see Key to the North American Species, Leafl. West. Bot. 7:148, Note 19.

59. Synonyms: *S. guianensis* K. Schum., *Sidastrum quinquenervium* Baker f. If the carpels are dehiscent as described by Baker, the genus *Sidastrum* Baker f. perhaps should be maintained.

60. *S. interrupta* Balb., of Colombia (carpels 8–10) presumably belongs to this section but was too imperfectly described for inclusion in this key. If a *Sida,* it seems very different from any other species in this key, to judge by a photograph of the upper part of the plant, which shows the broadly ovate, acuminate leaves nearly sessile and the flowers in dense, widely spaced, subsessile glomerules, these in long, naked, terminal, spike-like inflorescences. *S. sessiliflora* Hook. from Mendoza (Argentina?) with very broad merely acute leaves and very small, yellow flowers (carpels 10) is not identifiable and may not even be a *Sida,* as Hooker did not state that the carpels are 1-ovulate.

61. Synonyms: see Key to the North American Species, Leafl. West. Bot. 7:149, Note 33. Also *S. Arrudiana* Monteiro f. which Monteiro himself (ined.?) subsequently reduced to synonymy. This species is sometimes difficult to distinguish from *S. glomerata.* (See first paragraph 27.)

62. Petal-color as described by Rusby, but wants checking.

63. Monteiro's original description should be consulted for additional characters. In his key (Monogr. Malv. Bras.), he placed next to this species "*S. elata* Hassler" (*S. potentilloides* ssp. *elata* Hassler?) from Paraguay, distinguishing the latter as having the upper leaves broader and carpels larger (8.5 mm. long including the awns) and with the orifice rather long-pilose.

64. In *B. Rambo 40353* from Villa Manresa, Rio Grande do Sul, Brazil, the stems are rather copiously verrucose or shortly aculeate. I can find no mention of this character. It is less strongly developed in *Brizuela 924* and *1359* from Prov. Catamarca and in several other specimens from Argentina.

65. This variety, of Leite & Monteiro, was described in Lilloa 17:519.

66. Synonym (fide Monteiro f., Lilloa 17:516): *S. potentilloides* K. Schum., non St. Hil. Judging from the photograph of the type of *S. dubia* St. Hil. & Naud. this also may be a synonym.

67. Synonyms: see Key to the North American Species, Leafl. West. Bot. 7:149, Note 37. See also first paragraph 88 of this key.

68. Ulbrich described this as having about 10 styles and 5 carpels! From the shape of the calyx as shown in photograph of type, the fruit may well be 5-carpellary.

69. Basonym: *Sida cordifolia* var. *variegata* Griseb. Synonym: *S. montana* K. Schum. non D. Dietr.

70. As restricted by Monteiro f. (Lilloa 17:520) who cited *S. anarthra* Ekman as a synonym.

71. Synonym (fide Monteiro f., Lilloa 17:520): *S. camporum* (Hassler) Hassler. According to Monteiro f. (ibid., p. 516) *S. multicrena* var. *longearistata* (Hassler) Hochr., as interpreted by Rodrigo (Rev. Mus. La Plata ser. 2, 6:160–163, fig. 32) is *S. pseudo-potentilloides.*

72. An extremely variable species. Synonyms: see Key to the North American Species, Leafl. West. Bot. 7:150, Note 45. *S. lonchitis* St. Hil. & Naud. may also be a synonym. Several varieties were described in Fl. Bras. (12³:339), of which var. *surinamensis* (Miq.) K. Schum. *(S. Kohautiana* Presl) is the most distinct, having lanceolate or oblong-lanceolate, more or less rhombic, attenuate-acuminate leaves up to 15 cm. long and carpels with very long, flexuous awns. A specimen from Colombia *(Cuatrecasas 15913)* has similar carpels but the leaves are rounded at base and scarcely rhombic, although otherwise as in var. *surinamensis,* and the flowers are subcorymbosely clustered at apex of axillary branchlets. This may represent an undescribed species.

73. Several varieties have been described, including (both from Paraguay) var. *Rojasii* (Hassler) Hassler *(S. Rojasii* Hassler) with longer petioles and stipules than in typical *S. acuminata* and petals 7–7.5 mm. long; and var. *grandiflora* Hassler with petals 9 mm. long and about 1.5 times as long as the calyx.

74. Basonym: *S. rubifolia* St. Hil. ssp. *pseudocymbalaria* Hassler. Synonym: *S. rubifolia* f. *suborbicularis* Chod. & Hassler. Compare first paragraph 99. Plant very similar in general appearance to *S. argentina* (second paragraph 37) but described as having 10 muticous carpels.

75. Basonym: *Abutilon pulverulentum* Ulbr. Ulbrich gave the number of style-branches as 7 or 8, the number of carpels as about 15.

76. Synonym (fide Hassler): *S. paraguariensis* Hochr.

77. A homonym, *Sida purpurascens* Link *(Abutilon purpurascens* K. Schum.) being a much older name. Schumann (Fl. Bras. 12³:346) thought that *S. subsessilis* Turcz. might be the same as *S. purpurascens* Salzm., but Turczaninow's name is also invalid, there being an older *S. subsessilis,* of Colla.

78. Synonym (fide Monteiro f.): *S. Bradei* Ulbr., non Baker f.

79. Compare second paragraph 89.

80. Compare *S. pseudocymbalaria,* first paragraph 92.

81. Var. *pseudorhombifolia* Monteiro f., also from Brazil, was described as having linear to elliptic or subrhombic leaves, resembling *S. rhombifolia* but having different chromosome numbers.

82. Thought by Ulbrich to be related to *S. Barclayi* Baker f. See Key to the North American Species, first paragraph 49, Leafl. West. Bot. 7:146. The types of *S. tobatiensis,* to judge by a photograph, has much the appearance of *S. salviaefolia* Presl.

83. Reduced to synonymy under *S. subcuneata* by Monteiro f. (Lilloa 17:514). Compare *S. acrantha,* first paragraph 43.

AN ORCHID NEW TO THE UNITED STATES

BY DONOVAN S. CORRELL
Texas Research Foundation, Renner, Texas

Habenaria Chorisiana Cham., one of the rarest plants in North America, was apparently collected for the only time in the United States in 1912, but it has remained unrecorded until now. Three plants were found at Lake Serene, Snohomish County, Washington, on July 14, 1912, by H. B. Hinman.[1]

This collection was discovered recently when I was checking through the general herbarium that was maintained by Professor Oakes Ames during his lifetime at his home in North Easton, Massachusetts. A note by Professor Ames on the folder containing the mounted collection states "From C. V. Piper for determination." Only the generic name "Habenaria (Piperia)" was entered on the sheet.

At the time my work, Native Orchids of North America North of Mexico, was published in 1950, *Habenaria Chorisiana* was known to me only from British Columbia (Ucluelet, Vancouver Island), Alaska (Juneau, *fide* Anderson), the Aleutian Islands (Adak, Atka, Attu, and Unalaska), and Japan (op. cit., p. 64). An excellent drawing by Gordon W. Dillon appears on page 61 of the above-mentioned publication. The plants, which are the smallest of any species of *Habenaria,* seldom exceed 10 cm. in height, and the flowers are rarely more than 2 mm. in length. The pair of sub-basal leaves and the few-flowered, scapose inflorescence, coupled with the fact that the plants usually grow in heaths and swamps, make it difficult to detect in nature. This doubtless accounts, in part, for its apparent rarity.

It is of interest to note that Professor Ames' general herbarium was given to Texas Research Foundation by Mrs. Oakes Ames at the time the Oakes Ames botanical library, housed at North Easton, was acquired by the Foundation. It numbers nearly 8000 specimens that include such items as the collections of A. A. Eaton from southern Florida, Charles Wright's Connecticut collections, F. Tracy Hubbard's general collections, and M. L. Fernald's early collections from northeastern United States and Canada.

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[1] I wish to acknowledge the help of Dr. C. Leo Hitchcock and his observant secretary in locating Lake Serene for me. He informs me that it is about 8 miles south of Everett and about 2 miles inland from Norma Beach on Puget Sound.

A Lawn Weed from Stanford University, California. In August, 1957, J. T. Howell observed the vegetative portions of a lawn weed on the Stanford campus. The plant was unknown to Mr. Howell and had gone unnoticed by the Stanford botanists even though it made extensive, rather dense and not unattractive mats among the other lawn plants. Recently the plant has flowered on the margins of the lawn where it escapes the blades of the mower and is now known to be *Stellaria graminea* L., a native of Europe *(Thomas & Ernst 7202,* DS, CAS). Although this species has been found in the lawns of southern California and is known from the Pacific Northwest as well as the Atlantic Coast, it has not been reported from western middle California. What seems to be the same thing also occurs in a lawn near the Golden Gate Park Lodge in San Francisco, but Mr. Howell found no flowers on these plants during the last year. Consequently, this species was not included in the recently published Flora of San Francisco by Howell, Raven, and Rubtzoff.—J. H. Thomas and W. R. Ernst, Stanford University.

Iris longipetala in Sonoma County, California. *Iris longipetala* Herbert has been recently collectetd at two stations in Sonoma County, California: on a vernally wet flat bordering a marsh ¾ mile northeast of Occidental near the Graton road, where it forms a large colony *(Rubtzoff 3339,* May 11, 1957, in flower); and in moist open ground at the border of a marsh at the mouth of Atascadero Creek, one mile northwest of Graton, where a single small patch was found *(Rubtzoff 3635,* May 3, 1958, in flower). These, apparently, are the first records of this endemic of central coastal California from Sonoma County. Heretofore it has been recorded as far north as northern Marin County (cf. J. T. Howell, Marin Flora, 1949, p. 108). It may be mentioned here that David Douglas' flowering specimens of this species (cf. J. T. Howell, A collection of Douglas' western American plants – IV, Leafl. West. Bot. 2:116–119) most probably were not collected in Sonoma County, since Douglas made his trip through Marin and Sonoma counties in late July, 1831 (cf. J. T. Howell, Concerning David Douglas, Leafl. West. Bot. 3:160–162) when this iris does not bloom.—Peter Rubtzoff.

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JOHN THOMAS HOWELL

THOMAS HENRY KEARNEY: AUTOBIOGRAPHICAL NOTES

1874. Born June 27 at Cincinnati, Ohio.

1884. Moved to Knoxville, Tennessee, with father, mother, and two sisters.

1889. Was graduated from Knoxville High School and entered University of Tennessee, finishing junior year in 1891.

1892. Employed at University of Tennessee as assistant to F. Lamson-Scribner, the professor of botany.

1893. Spent several weeks in mountains of Kentucky collecting specimens of plants, and then went to New York, taking a special course in botany and geology at Columbia University and working in the herbarium as assistant curator under Prof. N. L. Britton.

1894. Went to Washington, D.C., as assistant agrostologist in the Department of Agriculture under Prof. Scribner who had come there from Knoxville. I held this position until 1897.

1898–1900. During this period I was assistant botanist in the Department of Agriculture under Mr. F. V. Coville, the chief of the Division of Botany. I made a botanical survey of the Dismal Swamp in southeastern Virginia, and then accompanied Mr. Coville as his assistant on the Harriman Alaska Expedition of 1899. A large botanical collection was made on the expedition which took us from Seattle to the Bering Straits.

1900–1944. Was successively assistant physiologist, physiologist, senior physiologist, and principal physiologist in the Bureau of Plant Industry, U. S. Department of Agriculture.

1901. Several months were spent in California and Arizona, studying alkali soils and crop growth on such soils.

1902. From August to October, I was in northern Africa with Thomas H. Means, of the U. S. Bureau of Soils, studying crop

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growth on alkali soils in Algeria and cotton cultivation in Egypt. Afterwards took several weeks leave of absence for travel through Italy, southern France, and Spain, mainly just sightseeing.

1903. Started work in Arizona breeding Egyptian-type cotton for production in the southwestern United States. This was to be my principal occupation from then on until I retired from government service. As a result, two varieties of long-staple cotton were developed: Pima, which was produced on a large scale during World War I, and S × P, which was the principal long-staple variety grown in the Southwest during World War II. Both of these cottons were extensively used in the manufacture of various military fabrics.

1904, 1905. The months of October to February were passed in Tunisia, North Africa, studying date culture and obtaining several hundred offshoots of the better varieties for planting in the desert region of southern California.

1920. The University of Arizona gave me the honorary degree of LL.D. in recognition of the work with Pima cotton.

1925–1942. During this period I became interested in the native flora of Arizona, making many collecting trips with my associates into all parts of the state and accumulating a large herbarium at our headquarters at Sacaton. Owing to the pressure of our official work with cotton, the study of the flora was mainly a week-end job. It resulted in the publication by the Department of Agriculture, in 1942, of "Flowering Plants and Ferns of Arizona," Robert H. Peebles being co-author with myself.

1944. Retired from Government Service on June 30 and went to San Francisco to live, my two sisters having settled there many years previously. At the cordial invitation of Miss Alice Eastwood, the veteran botanist who headed the Department of Botany in the California Academy of Sciences, I made my working headquarters there and was given the title of Research Associate in Botany. My time became occupied largely in preparing, with Mr. Peebles, "Arizona Flora," which was published in 1952 by the University of California Press and was essentially an enlarged edition of "Flowering Plants and Ferns of Arizona."

Also, I continued my studies of *Malvaceae* and published numerous papers on that subject in botanical journals.

1949. Served as president of the California Botanical Society.

1954. Appointed Honorary Curator of the Department of Botany of the California Academy of Sciences in June.

1956. Awarded Certificate of Merit by the Botanical Society of America on August 28 at Storrs, Connecticut.

* * *

The Certificate of Merit that Dr. Kearney received in 1956 was awarded "in recognition of distinguished achievement in and contributions to the advancement of botanical science," and was presented with the following particular citation: "for his early theoretical contributions to plant geography, his work in cotton breeding, his systematic studies in the *Malvaceae,* and his part in the preparation of the Flora of Arizona."

Dr. Kearney died in San Francisco on October 19, 1956.

BOTANISTS I HAVE KNOWN

BY THOMAS H. KEARNEY†

It is difficult to talk about people one has known without a little autobiographical information, which I shall include even at the risk of being thought more conceited than I actually am. The other day I was asked how I happened to become a botanist. As I look back, it seems the answer is I couldn't well have been anything else. I was fond of flowers in my earliest childhood, and not always the handsome or showy ones.

My first formal instruction in botany, if it could be called such, was by an elderly lady who also taught algebra and English literature in the high school in Knoxville, Tennessee. Our textbook was "How Plants Grow" by Asa Gray. This teacher introduced me to Albert Ruth, Superintendent of Knoxville Public Schools and an enthusiastic amateur botanist. I often went botanizing with him, our longest hike being to Thunderhead.

† Adapted from the quite ample notes prepared by Dr. Kearney for reminiscences given before a meeting of the California Botanical Society in Berkeley on April 16, 1953.

Professor Lamson-Scribner was the first professional botanist with whom I became acquainted. I studied botany under him at University of Tennessee. He had already achieved distinction as an agrostologist and one day showed me a specimen of the little western grass, *Scribneria,* named in his honor by Eduard Hackel. He was an enthusiastic photographer. One Sunday afternoon when I was working in the herbarium I heard him singing in the dark room over and over again:

O you are a Cinna
C - I - N - N - A
Working at photography
All the Sabbath day.

Desiring to broaden my experience I wrote to Dr. N. L. Britton and to Dr. B. L. Robinson asking them if there would be any opening for me in their institutions. Britton replied, offering me a small position in the herbarium of Columbia University which I promptly accepted. A few days later I received a cordial letter from Dr. Robinson with a similar offer of work at Harvard. I have often wondered how things might have turned out if I had gone to Cambridge instead of New York.

I found Dr. Britton to be a very likable person, full of fun, yet a tireless worker. In the Torrey Herbarium I was closely associated with John Small and A. A. Heller, and we ate together at the same boarding house. Small imbued me with his love of music and we often went to operas and concerts together, in the top gallery, of course. Other and less regular workers associated with Britton in my time were H. H. Rusby (Bolivian plants), Anna Murray Vail (asclepiads), Eugene Bicknell *(Sisyrinchium),* and George Nash (grasses). Nash owed his interest in grasses to George Thurber of Mexican boundary fame, who had been his neighbor at Passaic, New Jersey.

Meanwhile, Scribner had gone to Washington, as chief of the newly created Division of Agrostology in the United States Department of Agriculture. He offered me a position as assistant at a salary so tempting that I could not refuse it, although I was loathe to leave the very congenial associations in New York. I found J. G. Smith *(Sagittaria)* already installed in the division, and later A. S. Hitchcock and E. D. Merrill joined the staff. Scribner sent me on a grass collecting trip through the southeastern states, in the course of which I met Dr. Alvin Chapman, then nearly 90 years old, in his home at Apalachicola, Florida, and Dr. Charles Mohr, at Mobile, Alabama, then working on his Flora of Alabama.

Not wishing to make grasses my life work, I accepted F. V. Coville's offer of a job in the Division of Botany. I went with him on a reconnaissance of Dismal Swamp in southeastern Virginia, preparatory to making a botanical survey of the area. The swamp was beautiful at the end of April in 1898. We received news of Dewey's victory as we came out of the swamp.

In the following year I experienced one of the biggest events of my life, the Harriman Alaska Expedition in 1899, on which I went as Coville's assistant. Other botanists in the party were William Trelease, B. E. Fernow (then Chief Forester in the United States Department of Agriculture), and W. H. Brewer, who was advanced in years and inactive. Zoology was represented by C. Hart Merriam, who had organized the scientific personnel, W. H. Dall, Wm. E. Ritter, H. K. Fisher, Robert Ridgway, and D. G. Eliot. Louis Fuertes, then about my age but already distinguished as a bird artist, was usually the life of the party. Dr. Dall was an old Alaska hand and his knowledge was encyclopaedic. Geologists of the expedition were G. K. Gilbert, Henry Gannett, B. K. Emerson, and Charles Palache. The two "Johnnies" as we called them, Muir and Burroughs, represented natural history in general. In addition, there were the Harriman family and their friends.

The expedition was beautifully organized. There was a special train from New York to Seattle, followed by a two months cruise in an Oregon Railway and Navigation ship along the coast of British Columbia and Alaska, going as far north as Bering Straits and crossing to Plover Bay, in Siberia, just to say we had been in Asia. From time to time we camped on shore for a few days, the first time at Glacier Bay.

About this time I got to know Edward L. Greene, who had come to Washington as Professor of Botany at Catholic University. I went botanizing with him occasionally and found him most interesting but one to be handled with gloves. Greene's next door neighbor in suburban Brookland was Theodor Holm, who had gone as botanist on a Danish North Pole expedition. He and Greene were great friends for awhile but finally quarreled bitterly, both being somewhat cantankerous. At Holm's house I met the Canadian botanists, John and James Macoun.

William R. Maxon came to Washington a year or two after I did. He was already started on his life work with ferns, which he had studied under Prof. Underwood at Syracuse University.

We became very close friends immediately and remained so to the end of his life.[1]

During brief visits to Cambridge I became acquainted with Dr. B. L. Robinson who had a gentle and quiet but altogether charming personality. Fernald I liked too, although he was as different from Robinson as two persons could well be. His brusque "down East" manner did not annoy me as it did some people. I met Dr. W. G. Farlow, the distinguished cryptogamic botanist, only casually, but cannot resist mentioning him because of an anecdote I had from Dr. George Moore.[2]

After a few years in the Division of Botany, my conscience bothered me because my work had so little relation to agriculture. So I transferred again, this time to the Division of Vegetable Physiology and Pathology, soon to become the Bureau of Plant Industry. There I was associated with such brilliant men as Walter Swingle, David Fairchild, Erwin Smith, and O. F. Cook. Swingle and Fairchild interested me in plant exploration and encouraged me to make two trips to North Africa. In the course of these I became well acquainted with Louis Trabut, Government Botanist of Algeria and co-author with Battandier of a classic flora of that country. He was one of the most interesting and charming men I have ever known, with a keen but kindly Gallic wit. I had a delightful excursion with him into the country east of Algiers one beautiful spring day, when I had opportunity to appreciate his intimate knowledge of the flora and the resemblance of coastal Algeria to coastal California.

I worked in the Bureau of Plant Industry, first in crops for alkali land, then breeding Egyptian cotton, the latter at first under H. J. Webber. Breeding American Egyptian cotton became my principal occupation until my retirement from Government Service in 1944.

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[1] One of Dr. Kearney's favorite anecdotes was one he liked to tell on Dr. Maxon. On Sunday mornings Dr. Kearney often accompanied Dr. Maxon on bird watching expeditions in Washington's famous Rock Creek Park. One morning they met President Theodore Roosevelt horseback riding with his wife and daughter. Dr. Maxon, who knew the President, said, "Good morning, Mr. President."

President Roosevelt responded, then asked, "Can you tell me the name of that bird whistling over there—is it a Carolina wren or a cardinal?"

"It is a Carolina wren, Mr. President," answered Dr. Maxon.

"I can't tell them apart," complained the President.

"Well, most beginners do have that trouble, Mr. President," replied Dr. Maxon.

Dr. Kearney always added that those were Maxon's exact words although he later denied having said them.

[2] Dr. Kearney did not include the anecdote in these notes, but his hearers found it so amusing that it must be repeated here. Dr. Farlow was, in person, a weazened little old man at the time. He was botanizing on a suburban road near Cambridge one day, perhaps bending over to look at something on the ground, with his back to the road. A local matron driving past in her carriage was horrified to see that he was standing in a patch of poison ivy.

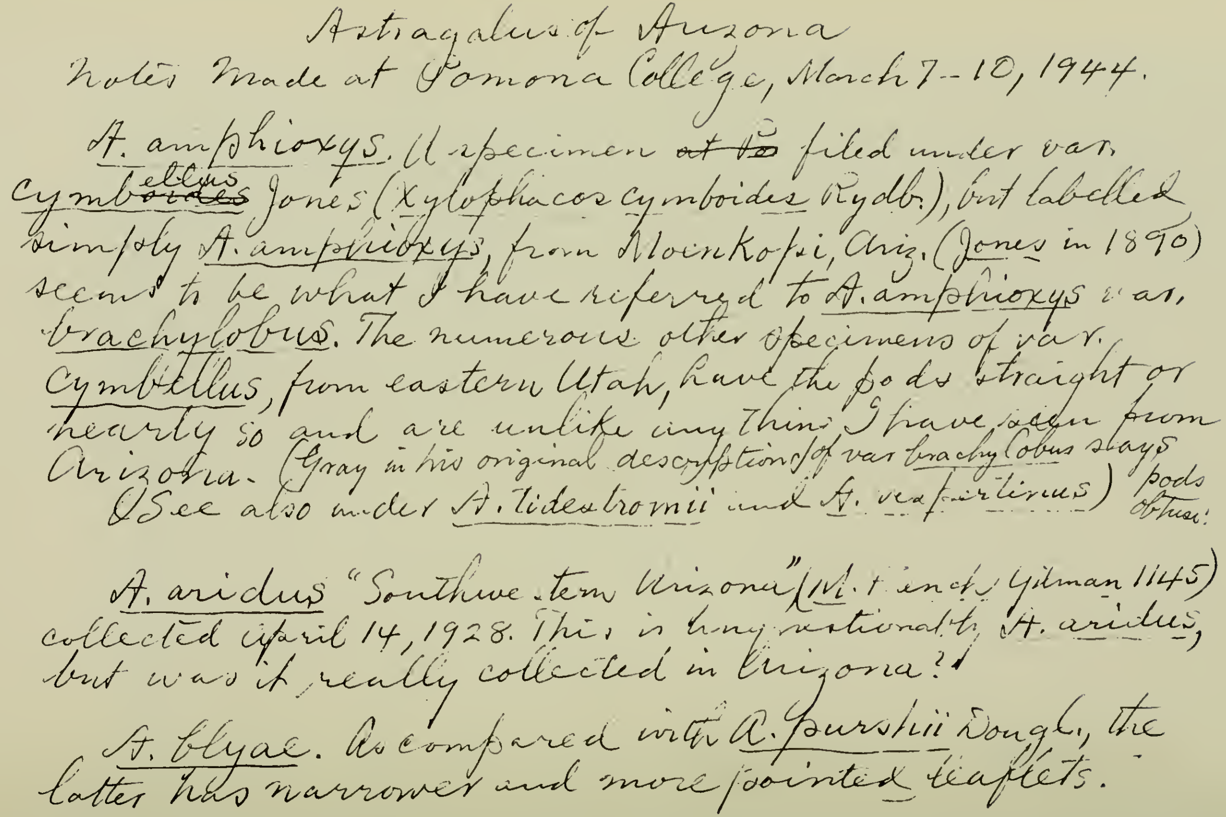
"Little boy!" she called. "Little boy! Come out of there! You are standing in poison ivy!"

The "little boy" slowly turned around, realizing he was meant, removed his hat, smiled, and bowed very low. The lady drove away.

Fig. 1. Arizona, September, 1901. T. H. Kearney in the San Francisco Mts. on his first visit to Arizona.

Fig. 2. Washington, D. C., about 1920. T. H. Kearney and associates in the United States Department of Agriculture (left to right): W. T. Swingle, C. S. Scofield, David Fairchild, T. H. Kearney, and E. C. Chilcott.

Fig. 3. San Francisco, California, April, 1953. T. H. Kearney and botanists at the California Academy of Sciences (left to right): L. S. Rose. J. T. Howell, T. H. Kearney, and Elizabeth McClintock. Photograph by Karl H. Rechinger, fil.



Astragalus of Arizona
Notes made at Pomona College, March 7--10, 1944.

A. amphioxys. A specimen ~~at~~ filed under var. cymbellus ~~cymboides~~ Jones (Xylophacos cymboides Rydb.), but labelled simply A. amphioxys, from Moinkopi, Ariz. (Jones in 1890) seems to be what I have referred to A. amphioxys var. brachylobus. The numerous other specimens of var. cymbellus, from eastern Utah, have the pods straight or nearly so and are unlike anything I have seen from Arizona. (Gray in his original description of var brachylobus says pods obtuse.) (See also under A. Tidestromii and A. [illegible]tinus)

A. aridus "Southwestern Arizona" ([illegible] Gilman 1145) collected April 14, 1928. This is [illegible] A. aridus, but was it really collected in Arizona?!

A. Clyae. As compared with A. Purshii Dougl., the latter has narrower and more pointed leaflets.

Fig. 4. Notes written by T. H. Kearney just before retirement from Government Service in 1941.
(Slightly reduced.)

The International Phytogeographic Excursion in 1913 gave me opportunity to meet several distinguished European botanists. Dr. and Mrs. F. E. Clements conducted the party in Colorado and Dr. H. L. Shantz and I took over in Utah. Professor Adolph Engler was the dean of the European party. He was very much the *Geheimrat* and we were all a little in awe of him. But his formality relaxed a little one morning when he came down to breakfast at the Antlers Hotel in Colorado Springs wearing a nightshirt in place of a shirt. His shirts, he explained, were all at laundries in various cities. He need not have apologized as it was a very handsome nightshirt, beautifully embroidered with blue silk forget-me-nots. I liked especially Professor Carl Schröter, the Swiss plant geographer, and Ove Paulsen, a young Danish botanist. Paulsen, fresh from a study of the Caspian Basin, was struck by the similarity of our Great Basin flora and vegetation types to those of the Caspian region.

When we reached Salt Lake City, the Chamber of Commerce tendered us a luncheon. That was the occasion of my first and rather unfortunate encounter with Marcus Jones. We had just seated ourselves when a waiter came to me and said that there was a gentleman in the lobby who wished to see me. When I went out to him, he launched into a bitter attack because he had not been invited to a botanical luncheon in his home town. I tried to explain that it was his own Chamber of Commerce, and not I, who was giving the luncheon. Also that the secretary of the Chamber was in the dining room and I would be glad to ask him to see Jones. But the latter would not listen to my explanation and went away still purple with rage.

During visits to San Francisco before I went there to live, I became well acquainted with Professor Setchell, whom I found always the best of company. Professor Jepson, to the best of my recollection, I met only once, although I had corresponded with him from time to time. When studying *Sphaeralcea,* I had occasion to examine two of his types. They told me in the Botany Department that an interview with Jepson was hard to obtain, but I took a chance and knocked on his door. It opened a mere crack and a voice inquired who I was and what I wanted. When I explained, the door opened wide and Jepson gave me a very cordial welcome.

Miss Alice Eastwood, whom I first knew personally in the late 1920's or nearly 1930's, always made me very much at home at her hospitable luncheon table at the Academy. When I told her I expected to retire from the Department of Agriculture in 1944

and was planning to make San Francisco my home, she invited me to make the Academy my headquarters. I accepted the invitation with alacrity and have never regretted doing so. I have found working conditions there very satisfactory and the personal associations most congenial.

BIBLIOGRAPHY OF THE SCIENTIFIC WRITINGS OF THOMAS H. KEARNEY

BY ELIZABETH MC CLINTOCK

The scientific writings of Thomas H. Kearney spanned a period of sixty-five years, from the publication of his first paper in 1891, when he was seventeen years old, until his death in 1956. His botanical interests during these years were varied as are shown in the titles listed below. His early papers showed his interest in systematic botany and plant distribution. However, during his years with the United States Department of Agriculture he published only a few papers in these fields but made his outstanding contribution in the development of long staple cotton for the southwestern United States. This work was of so much importance to the State of Arizona that he was given the degree of Doctor of Laws by the University of Arizona in 1920. After Dr. Kearney's retirement from the United States Department of Agriculture in 1944 he devoted all of his time to floristic work on Arizona plants and to systematic studies in the *Malvaceae*.

Dr. Kearney left an incomplete bibliography in which he divided his papers into the categories essentially the same as the ones used here. To his incomplete listing a number of titles have been added by consulting the catalogue of botanical papers and the reprint file in the United States Department of Agriculture Library in Washington, D.C.

Systematic Botany and Plant Geography

1891. Cleistogamy in Polygonum acre. Bot. Gaz. 16:314.
1892. Notes on the flora of Thunderhead. Agricultural Science 6:71–74.
1893. Additions to the Tennessee flora. Bull. Torrey Bot. Club 20:253, 254.

Notes on the flora of southeastern Kentucky, with a list of plants collected in Harlan and Bell counties in 1893. Bull. Torrey Bot. Club 20:474–485. Reprinted as Contrib. Herb. Columbia Coll. No. 43.

1894. Some new Florida plants. Bull. Torrey Bot. Club 21:482–486.

New or little known plants of the southern states. Bull. Torrey Bot. Club 21:260–266, 4 plates. Reprinted as Contrib. Herb. Columbia Coll. No. 57.

The nomenclature of the genus Büttneria Duham. Bull. Torrey Bot. Club 21:173–175.

Leucampyx Newberryi A. Gray. Bull. Torrey Bot. Club 21:82.

Steironema intermedium Kearney. Bull. Torrey Bot. Club 21:460.

An enumeration of the plants collected by Dr. Timothy E. Wilcox, U.S.A., and others in southeastern Arizona during the years 1892–1894. By Nathaniel L. Britton and Thomas H. Kearney. Trans. N.Y. Acad. Sci. 14:21–44. Sig. 2, pp. 17–32, is dated Dec. 4, 1894. Sig. 3 (given erroneously as 2), pp. 33–48, is dated Jan. 26, 1895.

1895. Calamagrostis scopulorum Jones. Bull. Torrey Bot. Club 22:517, 518.

Notes on grasses and forage plants of the southeastern states. U. S. Dept. Agr. Division of Agrostology Bull. No. 1, 28 pp.

1896. Buckleya again. Garden & Forest 9:168.

Some native ornamental grasses. Garden & Forest 9:152, 153; 172, 173.

1897. New or otherwise interesting plants of eastern Tennessee. Bull. Torrey Bot. Club 24:560–575.

[A note on several rare plants of the southern Alleghanies collected in Cocke County, Tennessee.] Plant World 1:32.

The pine-barren flora of the east Tennessee mountains. Plant World 1:33–35.

1898. The liana vegetation of southeastern Virginia. Plant World 1:169, 170.

[A note on *Senecio tomentosus* in the region of Norfolk, Virginia.] Plant World 1:159.

A revision of the North American species of Calamagrostis. Studies on American grasses, I. U. S. Dept. Agr. Division of Agrostology Bull. No. 11, pp. 7–42, 1 fig.

The science of Plant Ecology. Plant World 2:158–160.

[A note on *Tillandsia usneoides* in the Dismal Swamp.] Plant World 1:175.

[A note on *Orobanche minor* naturalized about Norfolk, Virginia.] Plant World 1:158.

Two southern plants. Bull. Torrey Bot. Club 25:344.

1900. Grammangis, Grammatophyllum, Habenaria. [*Articles in*] Bailey, L. H., Cyclopedia of American Horticulture. New York, Macmillan, 1900. Pp. 665; 706–708.

Plant geography of North America, III. The Lower Austral element in the flora of the southern Appalachian region. Science 12:830–842.

Concerning saxifrages. Plant World 3: 37, 38.

The plant covering of Ocracoke Island; a study in the ecology of the North Carolina strand vegetation. Contrib. U. S. Nat. Herbarium 5:261–319, 18 figs.

1901. Report on a botanical survey of the Dismal Swamp region. Contrib. U. S. Nat. Herbarium 5:321–550, 40 figs., 13 plates, 2 maps.

1903. The protective function of raphids. Science 18:244.

1904. Are plants of sea beaches and dunes true halophytes? Bot. Gaz. 37:424–436.

On the excretion of hygroscopic salts in Frankenia and Statice. Science 19:419, 420.

1907. *Review:* Relation of leaf structure to physical factors, by Edith S. Clements (Trans. Amer. Microscopical Society, 1905, pp. 19–102). Science 25:102, 103.

1914. Indicator significance of vegetation in Tooele Valley, Utah. By Thomas H. Kearney, L. J. Briggs, H. L. Shantz, and others. Jour. Agr. Res. 1:365–417, 20 tables, 13 figs., 7 plates.

Review: Botanical features of the Algerian Sahara, by W. A. Cannon (Carnegie Inst. Wash. Pub. No. 178, 1913). Science 40:751–753.

1918. Plant life on saline soils. Jour. Wash. Acad. Sci. 8:109–125.

1929. Plants of Lower California relationship in central Arizona. Jour. Wash. Acad. Sci. 19:70, 71.

1931. Plants new to Arizona. (An annotated list of species added to the recorded flora of the state or otherwise interesting.) Jour. Wash. Acad. Sci. 21:63–80.

1932. Arizona plants. (Further additions to the recorded flora of the state with notes on the characters and geographical distribution of these and other species.) By Thomas H. Kearney and George J. Harrison. Jour. Wash. Acad. Sci. 22:224–231.

1935. The North American species of Sphaeralcea subgenus Eusphaeralcea. Univ. Calif. Pub. Bot. 19:1–128, 12 plates, 1 fig.

1939. Arizona plants: new species, varieties and combinations. By Thomas H. Kearney and Robert H. Peebles. Jour. Wash. Acad. Sci. 29:474–492.

1940. Arizona plants: new species, varieties, and combinations. By F. J. Hermann, T. H. Kearney, and R. H. Peebles. Jour. Wash. Acad. Sci. 30:217–219.

Arizona localities of interest to botanists. *Mimeographed,* 43 pp. (Dated "Nov. 5, 1940.")

1942. Flowering Plants and Ferns of Arizona. By Thomas H. Kearney, Robert H. Peebles, and collaborators. U. S. Dept. Agr. Misc. Pub. No. 423, 1069 pp., 29 plates, 1 map.

1943. Gilia multiflora Nutt. and its nearest relatives. By Thomas H. Kearney and Robert H. Peebles. Madroño 7:59–63.

A new cliff-rose from Arizona. Madroño 7:15–18.

A consideration of some Palmer collections cited in the "Flowering Plants and Ferns of Arizona." By Rogers McVaugh and Thomas H. Kearney. Amer. Midland Nat. 29:775–778.

1945. A new name in Astragalus. Leafl. West. Bot. 4:216.

1946. A new Eriogonum from Arizona. Leafl. West. Bot. 4:267, 268.

Leaf hairs of Astragalus. Leafl. West. Bot. 4:223–227, 1 plate.

1947. Type of the genus Malvastrum. Leafl. West. Bot. 5:23, 24.

1949. Malvaceae: a new subtribe and genus, and new combinations. Leafl. West. Bot. 5:189–191.

1950. A plant new to California. Leafl. West. Bot. 6:81.
Notes on Malvaceae. Leafl. West. Bot. 6:51, 52.

1951. Arizona Flora. By Thomas H. Kearney, Robert H. Peebles, and collaborators. Berkeley and Los Angeles, University of California Press. 1032 pp., 45 plates, 1 map.
The American genera of Malvaceae. Amer. Midland Nat. 46:91–131.
The genus Malacothamnus Greene (Malvaceae). Leafl. West. Bot. 6:113–140.

1952. Notes on Malvaceae, II. Leafl. West. Bot. 6:165–172.
Notes on Malvaceae, III. Abutilon and Pseudabutilon in the Galápagos Islands. Madroño 11:285–289.

1953. Notes on Malvaceae, IV. Three new species and a new combination. Madroño 12:114–118.
Review: A Natural History of Western Trees, by Donald C. Peattie, Boston, Houghton Mifflin, 1953. Madroño 12:95, 96.
Recent additions to the known flora of Arizona. By Thomas H. Kearney, Elizabeth McClintock, and Kittie F. Parker. Leafl. West. Bot. 7:1–11.

1954. Further additions to the known flora of Arizona. Leafl. West. Bot. 7:165–175.
A tentative key to the North American species of Sida, L. Leafl. West. Bot. 7:138–170.
Two mallows new to California. Leafl. West. Bot. 7:130.
A tentative key to the North American species of Pavonia, Cav. Leafl. West. Bot. 7:122–130.
Notes on Malvaceae, V. Leafl. West. Bot. 7:118–121.

1955. Notes on Malvaceae, VI. Leafl. West. Bot. 7:271–273.
Notes on Malvaceae, VII. A new variety in Malacothamnus. Leafl. West. Bot. 7:289, 290.
Progress vs. Flora. Leafl. West. Bot. 7:284.
A tentative key to the North American species of Hibiscus, L. Leafl. West. Bot. 7:274–284.
A tentative key to the North American species of Abutilon, Miller. Leafl. West. Bot. 7:241–254.
Malvastrum A. Gray—a re-definition of the genus. Leafl. West. Bot. 7:238–241.

†1956. Arizona Plant Records, III. Leafl. West. Bot. 8:61–80.
Notes on Malvaceae, VIII. Eremalche. Madroño 13:241–243.
Malvaceae. Catálogo e Estatístico dos Gêneros Botânicos Fanerogâmicos (edited by Dr. João Angely), Curitiba, Brazil, Instituto Paranaense de Botânica, No. 24, 3 pp.

†1957. A tentative key to the South American species of Hibiscus, L. Leafl. West. Bot. 8:161–168.

†1958. A tentative key to the South American species of Abutilon, Miller. Leafl. West. Bot. 8:201–216.
A tentative key to the South American species of Pavonia, Cav. Leafl. West. Bot. 8:225–246.

A tentative key to the South American species of Sida, L. Leafl. West. Bot. 8:249–270.

* * * *

[Malvaceae of New Mexico.] MS., typewritten, 35 pp., submitted for publication in the Flora of New Mexico by E. F. Castetter.

[Malvaceae of Panama.] MS., typewritten, 97 pp., submitted for publication in the Flora of Panama edited by R. E. Woodson and issued in the Annals of the Missouri Botanical Garden.

Cotton

(Including Botany of Gossypium)

1908. Cotton culture in the southwestern United States. U. S. Dept. Agr. Bureau of Plant Industry Pub. No. 362, 3 pp.

Egyptian cotton in the southwestern United States. By Thomas H. Kearney and William A. Peterson. U. S. Dept. Agr. Bureau of Plant Industry Bull. No. 128, 71 pp., 5 plates, 9 tables, 2 figs.

1909. Experiments with Egyptian cotton in 1908. By Thomas H. Kearney and William A. Peterson. U. S. Dept. Agr. Bureau of Plant Industry Circular No. 29, 22 pp.

1910. Breeding new types of Egyptian cotton. U. S. Dept. Agr. Bureau of Plant Industry Bull. No. 200, 39 pp., 4 plates, 3 tables.

1912. Recent progress in cotton breeding in the United States. American Breeders Association, Annual Report 7:11–25.

Lint index and lint percentage in cotton breeding. American Breeders Association, Annual Report 7:25–29.

1913. Fiber from different pickings of Egyptian cotton. U. S. Dept. Agr. Bureau of Plant Industry Circular No. 110, pp. 37–39.

Egyptian cottons as affected by soil variations. U. S. Dept. Agr. Bureau of Plant Industry Circular No. 112, pp. 17–24.

Cotton as a crop for the Yuma Reclamation Project. By Carl S. Scofield, Thomas H. Kearney (and others). U. S. Dept. Agr. Bureau of Plant Industry Pub. No. 1009, 6 pp.

Seed selection of Egyptian cotton. U. S. Dept. Agr. Bull. No. 38, 8 pp.

Review: The cotton plant in Egypt, by W. Lawrence Balls (New York, Macmillan, 1912). Science 37:634, 635.

1914. Mutation in Egyptian cotton. Jour. Agr. Res. 2:287–302, plates 17–25.

1916. Tests of Pima Egyptian cotton in the Salt River Valley, Arizona. U. S. Dept. Agr. Bureau of Plant Industry, Alkali and Drought Resistant Plant Investigations, Pub. No. 1, 4 pp.

1918. A study of hybrids in Egyptian cotton. By Thomas H. Kearney and Walton G. Wells. Amer. Nat. 52:491–506.

A plant industry based upon mutation. Jour. Hered. 9:51–61.

1919. Production of American Egyptian cotton. By C. S. Scofield, T. H. Kearney (and others). U. S. Dept. Agr. Bull. No. 742, 30 pp., 3 tables.

1921. Pollination of Pima cotton in relation to the yield of seed and fiber. Jour. Hered. 12:99–101.

Heritable variation in an apparently uniform variety of cotton. Jour. Agr. Res. 21:227–241, plates 48–54.

1922. The uniformity of Pima cotton. U.S. Dept. Agr. Circular No. 247, 6 pp.

1923. Self-fertilization and cross-fertilization in Pima cotton. U.S. Dept. Agr. Bull. No. 1134, 68 pp., 39 tables, 7 plates.

Segregation and correlation of characters in an upland-Egyptian cotton hybrid. U.S. Dept. Agr. Bull. No. 1164, 57 pp., 21 plates, 14 tables.

1924. A hybrid between different species of cotton. Jour. Hered. 15:309–320, 11 figs.

Non-inheritance of terminal bud abortion in Pima cotton. Jour. Agr. Res. 28:1041, 1042, 1 plate.

Diversité dans les hybrides de cotonniers. Un hybride entre deux espèces différentes de Gossypium. Revue de Botanique Appliquée. 4. Année, Bulletin n. 29:793–803.

Selective fertilization in cotton. By Thomas H. Kearney and George J. Harrison. Jour. Agr. Res. 27:329–340.

The salt content of cotton fiber. By Thomas H. Kearney and C. S. Scofield. Jour. Agr. Res. 28:293–295.

Length of cotton fiber from bolls at different heights on the plant. By Thomas H. Kearney and George J. Harrison. Jour. Agr. Res. 28:563–565, 1 fig., 3 tables.

Inheritance of petal spot in Pima cotton. Jour. Agr. Res. 27:491–512, 1 plate.

1926. Correlation of seed, fiber and boll characters in cotton. Jour. Agr. Res. 33:781–796.

Heritability of different rates of shedding in cotton. By Thomas H. Kearney and Robert H. Peebles. Jour. Agr. Res. 33:651–661, 1 fig., 5 tables.

[Newspaper article.] Pima cotton has not deteriorated. Associated Arizona Producer, Phoenix, April 1, 1926.

Bagging cotton flowers to prevent accidental cross-pollination. By Thomas H. Kearney and Dow D. Porter. Jour. Hered. 17:273–279, 4 figs.

1927. Inheritance of rate of shedding in a cotton hybrid. By Thomas H. Kearney and Robert H. Peebles. Jour. Agr. Res. 34:921–926.

Inheritance of smooth seeds in cotton. By Thomas H. Kearney and George J. Harrison. Jour. Agr. Res. 35:193–217, 10 figs., 6 tables.

Cotton of American-Egyptian variety in U.S. U.S. Dept. Agr. Yearbook 1926, pp. 251–254, 1 table, 1 fig.

1928. Variation in seed fuzziness on individual plants of Pima cotton. By Thomas H. Kearney and George J. Harrison. Jour. Agr. Res. 37:465–472, 4 figs., 4 tables.

Mendelian inheritance of leaf shape in cotton. By Robert H. Peebles and Thomas H. Kearney. Jour. Hered. 19:235–238, 3 figs.

1929. Development of the cotton boll as affected by removal of the involucre. Jour. Agr. Res. 38:381–393, 4 figs., 4 tables.

1930. Principles of plant breeding as applied to cotton. Documentary Material on Inter-American Conference on Agriculture, Forestry and Animal Industry, Washington, 2:243–249.

"Maarad" cotton of Egypt same as Arizona Pima. U.S. Dept. Agr. Official Record 9 (No. 18):8.

Department develops new cotton of Egyptian type. U. S. Dept. Agr. Official Record 9 (No. 21): 2.

Cotton breeding today works with main types known in remote past. U. S. Dept. Agr. Yearbook 1930, pp. 182–190, 6 figs.

Short branch, another character of cotton showing mono hybrid inheritance. Jour. Agr. Res. 41:379–387, 2 figs., 2 tables.

Cotton plants, tame and wild. Jour. Hered. 21:195–210, 10 figs.

Genetics of cotton. A survey of our present knowledge. Jour. Hered. 21:325–336, 6 figs.; 375–384, 4 figs.; 409–415, 1 fig.

1931. Cotton—history, botany, and genetics. American Genetic Association, Washington, 195–210, 325–336, 375–384, 409–415, illus. (Reprinted from Jour. Hered., Vol. 21, 1930, without change of paging.)

1932. Pollen antagonism in cotton. By Thomas H. Kearney and George J. Harrison. Jour. Agr. Res. 44:191–226, 1 fig., 15 plates.

1933. A new Gossypium of Lower California. Jour. Wash. Acad. Sci. 23:558–560.

1934. American wild cottons with thirteen chromosomes. Jour. Hered. 25:305–312, 4 figs.

1935. S × P cotton in comparison with Pima. U. S. Dept. Agr. Bureau of Plant Industry. *Mimeographed,* 17 pp.

1936. Relationships of the cultivated and wild cottons of the world. (Paper presented at the Southern Agricultural Workers, Jackson, Miss., February 5–7, 1936). *Mimeographed,* 11 pp.

1937. Ingenhouzia and Thurberia. Amer. Jour. Bot. 24:298–300.

1939. Morphology of two American wild species of cotton and of their hybrid. By Thomas H. Kearney and Irma E. Webber. Jour. Agr. Res. 58:445–459, 2 plates, 1 table, 5 figs.

1940. S × P cotton in comparison with Pima. By T. H. Kearney, R. H. Peebles, and E. Gordon Smith. U. S. Dept. Agr. Circular No. 550, 15 pp., 8 tables, 5 figs.

1942. Cotton breeding in relation to taxonomy. Proc. 8th Amer. Sci. Congress, Washington, 3:251–255.

1943. Egyptian-type cottons: their origin and characteristics. Beltsville, Md., U. S. Dept. Agr. Bureau of Plant Industry. *Mimeographed,* 23 pp.

1948. *Review:* The Evolution of Gossypium and the Differentiation of the Cultivated Cottons, by J. B. Hutchinson [and others], London, 1947. Madroño 9:228, 229.

†1957. Wild and domesticated cotton plants of the world. Leafl. West. Bot. 8:103–109.

Alkali Relations of Plants

1902. Some mutual relations between alkali soils and vegetation. By Thomas H. Kearney and Frank K. Cameron. U. S. Dept. Agr. Rep. No. 71, 60 pp.

1903. Crops used in the reclamation of alkali lands in Egypt. By Thomas H. Kearney and Thomas H. Means. U. S. Dept. Agr. Yearbook, 1902, pp. 573–588, 4 plates, 1 fig.

1907. The comparative tolerance of various plants for the salts common in alkali soils. By T. H. Kearney and L. L. Harter. U. S. Dept. Agr. Bureau of Plant Industry Bull. No. 113, 22 pp., 10 tables.

1911. The choice of crops for alkali land. U. S. Dept. Agr. Farmers' Bull. No. 446, 32 pp., 2 tables.

[Translation.] Elección de plantas propias para terrenos salados (tr. by L. E. Mendoza Vargas). Mexico, Secretaria de Fomento, 1912.

1913. The wilting coefficient for plants in alkali soils. U. S. Dept. Agr. Bureau of Plant Industry Circular No. 109, pp. 17–25, 6 tables.

1920. The relative absorption by soil of sodium carbonate and sodium chloride. Soil Science 9:267–273.

The choice of crops for alkali land. (Revised.) U. S. Dept. Agr. Farmers' Bull. No. 446, 32 pp., 2 tables.

1924. The choice of crops for alkali lands. (Revised.) U. S. Dept. Agr. Farmers' Bull. No. 446, 25 pp., 2 tables.

1925. Rendimento de terras alcalinas. Boletim da União Pan-Americana 27 (No. 5):319–331.

La producción de cosechas en suelos alcalinos. Washington, La Unión Panamericana, 14 pp., illus.

1936. The choice of crops for saline land. By T. H. Kearney and C. S. Scofield. U. S. Dept. Agr. Circular No. 404, 24 pp., 1 table. "This circular is a revision of and supersedes Farmers' Bulletin 446, The Choice of Crops for Alkali Lands."

Dates

1905. Agriculture without irrigation in the Sahara Desert. U. S. Dept. Agr. Bureau of Plant Industry Bull. No. 86, 30 pp., 5 plates, 1 map.

1906. Date varieties and date culture in Tunis. U. S. Dept. Agr. Bureau of Plant Industry Bull. No. 92, 112 pp., 10 plates, 51 figs.

1910. The date gardens of the Jerid. Nat. Geog. Mag. 21:543–567.

1911. On the trail of the date. Good Health 46:203–210, 351–356.

The country of the ant men. Nat. Geog. Mag. 22:366–382.

Agriculture

1905. Agricultural exporations in Algeria. By Thomas H. Kearney and Thomas H. Means. U. S. Dept. Agr. Bureau of Plant Industry Bull. No. 80, 98 pp., 3 plates.

1908. Dry-land olive culture in northern Africa. U. S. Dept. Agr. Bureau of Plant Industry Bull. No. 125, 48 pp., 5 plates, 5 tables, 10 figs.

1912. The water economy of dry-land crops. By Thomas H. Kearney and H. L. Shantz. U. S. Dept. Agr. Yearbook, 1911, pp. 351–362.

Obituaries

1922. Louis Trabut, botanist and plant breeder. Jour. Hered. 13:153–160, 5 figs.

1926. William Edward Safford, 1859–1926. Jour. Hered. 17:365, 366, 1 plate.

1952. Walter T. Swingle, 1871–1952. Jour. Wash. Acad. Sci. 42:208.

†1957. Robert Hibbs Peebles, 1900–1956. Madroño 14:11–13, 1 fig.

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The publication of the present issue of LEAFLETS OF WESTERN BOTANY and of Dr. Kearney's more recent studies in the Mallow Family in South America* has been made possible through the generous aid we have received from the Thomas H. Kearney Memorial Fund. This fund, which was established primarily as a memorial to Dr. Kearney under the auspices of the California Academy of Sciences, was later augmented by friends who wished to insure the publication of the South American manuscripts left at the time of his death. Contributors to this fund, which has been devoted in its entirety to publish these papers, were: Mrs. Margaret E. B. Fleming, Miss Roberta Gilbert, George J. Harrison, J. T. Howell, Mrs. Ira Kahn, Col. and Mrs. William M. McKee, Mrs. James E. Mulrine, Mrs. Olga Padgett, Peter H. Raven, Lewis S. Rose, Peter Rubtzoff, Ira L. Wiggins, and the California Botanical Club.—J. T. HOWELL.

EX HONORIS SERTIS

I realize that Dr. Kearney's cotton work was only a part of his wide interests and experience, but it was an extremely important part to all of us in many countries who are concerned with the genetics and evolution of cotton. His early collections of the wild American species and his generosity in making his collections available to others made possible the detailed genetic and cytological analyses which came later. And I don't suppose anyone has made such a careful study of segregation in species hybrids as he did in his paper "Segregation and correlation of characters in an Upland-Egyptian cotton hybrid." The problems he uncovered then are still puzzling today, and his papers are classics among the literature on species hybrids.—S. G. STEPHENS, North Carolina State College, Raleigh; November, 1956.

*These papers, all published in the present volume of LEAFLETS OF WESTERN BOTANY, were proposals in the classification of South American species in *Hibiscus* (pages 161 to 168), *Abutilon* (pages 201 to 216), *Pavonia* (pages 225 to 246), and *Sida* (pages 249 to 270).

INDEX

COMPILED BY ANITA M. NOLDEKE

ERRATA

Page 58, line 15: *for* LILLIAN *read* LILIAN.
Page 95, line 12: *for* Marlin *read* Maralin.
Page 97, line 45: *for* Charlton *read* Carlton.
Page 100, lines 11 and 12: *for* Engles *read* Engle; and *for* Austin, Minn., *read* Waterloo, Iowa.
Page 153, line 14: *for* Presl *read* (Presl) Kunth.
Page 228, line 17: for *flavispana* read *flavispina*.