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♂
H. Grönvold

♀

THE LESSER FLORICAN OR LIKH (*Sypheotis aurita*).

$\frac{1}{2}$ natural size.

JOURNAL OF THE Bombay Natural History Society.

JULY 1912.

VOL. XXI.

No. 3.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART VII.

With Plates VII and A & B.

(Continued from page 337 of this Volume.)

Genus—*SYPHEOTIS*.

The principal generic distinction between the birds of this genus and other Bustards is the greater comparative length of the legs. The tarsus in *Sypheotis* is equal to rather more than $\frac{1}{3}$ rd the length of the wing, whereas in all other Bustards it is only equal to $\frac{1}{4}$ th. The chief generic characteristic relied on by Blanford is the supposed fact of the males putting on a seasonal breeding plumage. It, however, now seems quite certain that the male *Sypheotis bengalensis* retains this adult plumage, when once fully acquired, throughout the year, though the smaller bird, *Sypheotis aurita*, does, on the contrary, acquire an annual nuptial plumage. The primary quills of both species are notched on the inner web and are very attenuated, but especially so in *aurita*.

In the breeding season the males of both species, and during the whole year the fully adult males of *Sypheotis bengalensis*, have the

head and the whole of the lower parts black and both species acquire ornamental plumage either on the head or neck. *Sypheotis bengalensis* is crested and has long, full feathers all down the neck to the breast, whilst *Sypheotis aurita* has the feathers of the side of the head and chin somewhat lanceolate and lengthened, and a curious tuft of long feathers from each side of the head below the ear coverts, the longest of which have the stems narrowly webbed and the ends spatulate.

Sharpe divides *Sypheotis* into two genera, creating a new genus *Houbaropsis* for the larger bird and retaining *Sypheotis* for the smaller. The fact of the latter having a seasonal change of plumage and the former not having one would add considerable strength to the reasons for dividing them, but for the purpose of this work I retain them in the one genus.

KEY TO THE SPECIES.

Wing 7" to 10"; tarsus 3·35" to 4·5" ... *S. aurita*.

Wing 13" to 15"; tarsus 5" to 6·2" ... *S. bengalensis*.

SYPHEOTIS AURITA.

The Lesser Florican or Likh.

? *Otis indica*.—Gm. Syst. Nat. i, p. 725; Lath. Ind. Orn. ii, p. 661; Oates. Cat. Eggs B. M. ii, p. 87; Sharpe Hand-l. i, p. 175.

Otis aurita.—Lath. Ind. Orn. ii, p. 660.

Otis marmorata.—Gray and Hardw. Ill. Ind. Orn. 1, pl. 60.

Sypheotides aurita.—Less. Rev. Zool., 1839, p. 47; Blyth, Cat. B. Mus. As. Soc., p. 259; Jerdon, B. of Ind. iii, p. 619; King, J. A. S. B. xxxvii, part 2, p. 216; MacMaster, *ibid*, xl, part 2, p. 215; Stoliczka, *ibid*, xii, part 2, p. 250; Gould, B. of Asia, vii, pl. 57; Hume, Str. Feath. i, p. 136, 228; Adam, *ibid*, p. 393; *id*, *ibid*, ii, p. 339; Ball, *ibid*, p. 428; LeMess, *ibid*, iii, p. 379; Blyth, B. of Burm., p. 152; Butler, Str. Feath. iv, p. 10; Fairb., *ibid*, p. 262, 266; Butler, *ibid*, v, p. 231; Ball, *ibid*, p. 419; Hume and Marsh., Game B. i, p. 34; iii, p. 425; Hume, Cat. No. 839; *id*, Str. Feath. viii, p. 111; MacInroy, *ibid*, p. 491; Butler, Cat. Bird. of Sind, etc., p. 56; *id*, Cat. B. S. Bom. Pres.,

p. 71; Vidal, Str. Feath. ix., p. 77; Davidson, *ibid*, x., p. 318; Hume, *ibid*, p. 412; Barnes, B. of Bom., p. 322; Murray Vert. Zool. Sind, p. 220; Barnes Jour., B. N. H. Soc. i, p. 57; *id*, *ibid*, vi, p. 13; Laurie, *ibid*, p. 94; Littledale, *ibid*, p. 199; Davidson, *ibid*, xii, p. 64; Dewar, *ibid*, xvi, p. 495.

Eupoditis aurita.—Gray, Cat. Mamm., etc., Nepal Cres. Hodgson, p. 130; *id*, Hand-b. B., iii, p. 9.

Sypheotis aurita.—Hume, Nests and Eggs, Ind. B., p. 561; Oates, 2nd Ed., *ibid*, iii, p. 380; Blanford, Avi., B. I., iv., p. 198; Sharpe, Birds of B. M., xxiii, p. 313; *id*, Oates, Game B. of Ind. i, p. 419; Finn, In. Waders, p. 125; Symons, Jour., B. N. H. Soc., xix, p. 261; R. K., *ibid*, p. 995.

Vernacular Names.—Ker-mor, Guzerat; Sun-mor, Deccan and Marathi Districts; Chini-mor, Belgaum; Khartitar, Bheels; Likh, Chota Charat, N.-W. Provinces; Charas, Chulla Charas, Southern India; Kannoul, Kanarese; Niala nimili, Telugu; Wurragu Koli, Tamil; Bursati or Kala Tugder, Rhotak, Gurgaon.

Description.—*Adult Male*.—Whole head and neck, including ear plumes glossy black; chin and centre of upper throat pure white. Remainder of underparts black; the breast, like the head and neck, is a deep velvety black, often highly glossed, but the abdomen is less glossy and this and the undertail coverts are sometimes rather dingy and brownish. Below the hind neck and between this and the back there is a broad band of white which descends as far as the upper breast, often encroaching upon it for almost an inch on either side. Upper plumage a sandy buff, each feather with the centre having a spear-shaped black, or brownish black, patch margined with yellowish sandy, the rest of the feather vermiculated with black or brown. On the lower back the vermiculations are less definite and the central marks obsolete, whilst on the central tail coverts their place is taken by definite cross bars of deep brown. Rectrices sandy buff with a rufous tinge, finely vermiculated as on the back and with four definite cross bars of blackish brown. Scapulars like the back but those nearest the shoulder coverts more or less freckled with white. Larger wing coverts black, the hidden portions of the inner webs freckled with white and brown; remaining median and lesser coverts, where visible, white; the

basal portion of the secondary coverts freckled with brown and a few coverts next the inner secondaries approximating these in colouration, but retaining a great deal of white. First two, three, or in some cases four outermost primaries uniform brown; the remainder with broad bars of rufous buff, these widening towards the secondaries. Outer secondaries mottled brown and buff, sparsely freckled with white at the tips, inner secondaries like the back but with white freckling on the edges near the coverts and with the smallest feathers next the scapulars marked with rufous buff.

The feathers of the upper throat are lengthened, those behind the ear coverts being greatly so, the three longest sometimes reaching as much as 5" in length and generally exceeding $3\frac{1}{2}$ ". As a rule the three longest feathers are graduated, and though in some cases they are sub-equal, there is nearly always a great difference in length between these three feathers and the others which may vary between 1" and 2". These feathers, more especially the longer ones, are spatulate in shape.

Wing 7·1" to 8·05"; tarsus 3·35" to 3·75"; bill at front 1·25" to 1·5"; tail 3·25" to 4·5".

"The irides are dull yellow, sometimes very pale, sometimes brownish; the legs pale, somewhat fleshy yellow, sometimes hoary, sometimes more dusky; the bill is pale yellow, somewhat fleshy towards gape, the ridge, tip and more or less of the upper surface shaded with dusky heavy brown." (Hume).

"Length 17·25" to 19"; expanse 27·5 to 32; wing (to end of longest primary) 7·3 to 7·9; tail 4·1 to 4·5; tarsus 3·65 to 3·9; bill from gape 2·0 to 2·1. Weight 14 ozs. to 1 lb. 4 ozs." (Hume.)

"Total length 15 inches, culmen 1·5, wing 7·9, tail 3·5, tarsus 3·5. (Sharpe).

From the above measurements it will be seen that this Bustard varies very considerably in size, but the measurements first given include those of the whole of the British Museum series (some 85 birds), as well as many others which have passed through my hands, so may be taken as shewing fairly satisfactorily the range of variation. The only bird of the British Museum series omitted from

the above measurements is an abnormally small bird with a wing of only 6.85". It may be noticed that I have not given measurements either of length or expanse in describing this or any other bird, but I have omitted these measurements intentionally as they depend far too much upon every individual sportsman's way of measuring and the extent to which wings and neck are stretched during the operation.

Adult female.—Forehead, crown and occiput black, the feathers more or less tipped with buff and the inner webs of the central feathers also buff, forming a well defined mesial streak; lores, fairly well defined supercilium and post orbital region buff with a few black specks and a line of black specks running under the eye; sides of head and ear coverts buff, immaculate or with a few fine specks only; chin, throat and sometimes the region below the ear coverts white. Posterior aspect of the neck buff, finely vermiculated with black, or dark brown, anterior aspect buff, with broad splashes of black forming two broad streaks down to the breast; sides of the neck next the shoulders with similar streaks; breast buff with bold black markings and freckles, the latter often forming crescentic marks. Remainder of lower parts buff, often almost white, the flanks more or less freckled and barred with blackish and the innermost axillaries black.

Back, scapulars, rump and upper tail coverts buff, each feather with a broad central spear head of black, surrounded with buff. These marks disappear on the rump which is more indefinitely marked. Tail, like the back but without the spear head marks and with four broad bands of black. Quills of the wing as in the male. Wing coverts buff, the outer sparsely barred with brown or black, the inner and smaller profusely barred and to some extent freckled with black.

Wing 8.25" to 9.75"; tarsus 3.55" to 3.85"; bill at front 1.45" to 1.65"; tail about 4.5".

"*Female*.—Length 18 to 21.4; expanse 29 to 36; wing 9.0 to 9.75; tail 4.7 to 5.0; tarsus 3.9 to 4.4; bill from gape 2.28 to 2.3. Weight 1 lb. 2 ozs. to 1 lb. 10 ozs." (Hume).

There are several females in the British Museum collection with wing under 9", but these are probably young birds. Fully adult

birds, *i.e.*, over 18 months, will not often be found with a wing of less than 9".

Inglis sends me a note on the soft parts of a female shot by him in Behar as follows: "Bill dusky red, culmen dark brown, gape and base of lower mandible yellow; *iris* yellow tinged with red; legs dull dusky yellow."

Adult male in winter plumage.—Similar to the female, but retaining a considerable amount of white on the wing.

Young male.—Like the female.

Nestling.—"An almost uniform dirty pale yellow colour, with an unclosed V (*i.e.* ν) on the crown of the head in dingy black, and blotches, rather stripy, of black on the wing, back and sides, and about the ears; legs and beak a colour between pale blue and pale pink; and on the tip of the beak a little lump of pale pearly white." (Davidson as quoted by Hume.)

Distribution.—In "Game Birds" Hume thus describes the habitat of the Lesser Florican:—

"I find great difficulty in defining the limits within which the Lesser Florican occurs; firstly, because it is irregularly migratory and secondly because individual birds straggle in the most unaccountable manner hundreds of miles beyond the furthest districts which it at all regularly visits."

"Dr. Jerdon tells us that 'this species is found throughout India, from near the foot of the Himalayas to the southernmost districts,' but this conveys, I think, a somewhat erroneous idea of its distribution, which is not nearly so wide as this might seem to imply."

"Although a certain number are probably permanent residents of Khandesh, Nasik and Ahmednagar, the real home of the Lesser Florican is in the drier portions of the Peninsula, lying east of the Western Ghats and south and east of the Godavari."

"It is, of course, confined to plains and open country, and does not ascend any of the hills, though a single specimen was once killed, I hear, on the slopes of the Nilgiris, between Neddiwattum and Pykarra, going down to the Wynaad."

"During the rains when it breeds, although many breed in the Deccan, as, for instance, about Sholapur, the majority, I think,

move northwards and westwards, extending over the western parts of the Central Provinces, the Central India Agency, the southern and central portions of Rajputana, Khandesh, Guzerat, Cutch, Kathiawar and Southern Sind."

"The migration is, however, irregular, as in some years it extends much further than in others. The birds are plentiful in one year where in the next none or few are to be met with."

"In years when the rainfall is plentiful, they are pretty common during the monsoon a little south of Delhi, in Rohtak and Gurgaon. Generally, there are a good many about Jhansi and so on, but except as stragglers, they are not found in those parts of the country that I know further north than a line joining Sersa and Delhi, nor do they cross the Jumna in any numbers."

"Although I have known single specimens killed near Lucknow, Sultanpur, and other places in Oudh; though I have myself shot single birds occasionally in the Meerut and Etawah districts; though Ball got a specimen in Serguja, Hodgson others in the valley of Nepal; though Jerdon says he has known of their occurrence in Purneah, and Parker tells me they have occurred in Nuddea; though one specimen has been killed on the Mekran Coast near Gwader and another at Sandoway in Arakan, I do not, as at present informed, consider that either Beluchistan, the Punjab, the North-Western Provinces, north and east of the Jumna, Oudh, Chota Nagpore or any part of Bengal or the countries eastwards, can be properly included within its normal range.

It occurs nowhere out of India."

It will be seen that Hume refers to a bird shot at Sandoway on the Arrakan Coast. This record is from the *Bengal Sporting Magazine* for 1835, where a writer, on page 151, records the shooting of a Lesser Florican, and this record is quoted by Blyth in his "Birds of Burmah," p. 152. It is, however, extremely doubtful if this record is a really correct one and *Sypheotis aurita* should not be accepted as a Burmese Bird on the strength of it. The next point furthest east from which it has been recorded is Dinajpore, from which place there is a specimen in the British Museum, and further south of this again from Purulia, Purnea and Nadia, from each of which district stragglers are occasionally

obtained, but it has never been obtained from any of the districts east of the Teesta or south of the Brahmapootra Rivers, leaving thus a very wide stretch of country or sea to be passed over before the Arrakan Coast is reached.

To Hume's districts of Purnea and Nadia in Bengal, from both of which districts I have also seen specimens, must be added Maldah where birds have been seen and shot by Mr. G. Hennessy.

As regards the Punjab and North-West Provinces, birds wander into these so regularly, year after year, though in but small numbers, that it is hardly possible to regard these Provinces as outside their normal habitat.

In the south, Major Ch. MacInroy says that "Florican are pretty numerous throughout East Mysore, but, for some reason which I cannot divine, are not nearly so much so in the western division of the Province." He further records a bag of 30 birds made some 25 miles from Bangalore and adds that 4 or 5 birds have been killed in a morning near Coconada.

In his list of the Birds of the South Konkan, Vidal remarks that the Lesser Florican "rarely pass the Ghat barrier which divides the Konkan from the Deccan. In seven seasons spent in the Ratnagiri District I have only seen two birds" . . . "I have also heard of one having been obtained at Dapuli."

Mr. N. S. Symons reports two birds shot near Panwell in the S. Bombay Presidency; and Dewar, it should also be mentioned, notes that it is seen sometimes near and about Madras, but it occurs in that district regularly and is resident, and it extends north into Orissa, Blyth having shot it near Cuttack.

In a footnote, p. 24, of "Game Birds", Hume quotes Hodgson as saying: "Appears here (Valley of Nepal) about middle of May and disappears middle of June" and then he (Hume) goes on to say: "It may be that there is a permanent colony of this species, of which I know nothing as yet, in northern Behar, Gorakhpur, Busti, etc.

In partial confirmation of this surmise Mr. A. E. Osmaston sends me the skin of a young male from Gorakhpur and in the letter sent with it, writes: "I also saw them at the beginning of last rains (1909) but I have never seen them at any other time

of the year here and I presume they only come here to breed and I think only a few come even then, as the grassy land they seem to like is very limited in extent."

This record, therefore, though confirming the presence of Likh in and about Gorakhpur during the breeding season does away with the theory of a "permanent colony" and infers that these birds, as well as those which reach Nepal migrate from a good deal further south than Hume imagined. From Bihar Mr. Inglis reports them as decidedly rare and has not seen many himself. He tells me that he has skins of birds shot in Bihar in April and May, in one case that of a male just assuming breeding plumage.

The Lesser Florican is undoubtedly locally migratory, but, as Hume remarks, its migrations are most uncertain and irregular and are probably governed by the state of the rains and food supply and possibly by other factors not yet known either to field naturalists or scientists. At present, all that can be said is that during the breeding season the birds seem to concentrate in suitable places in the centre of their habitat and after this season is over to disperse, more or less, in all four quarters, stragglers then appearing far from any of their favourite haunts. Hill ranges certainly divert and interrupt these local migrations to a great extent wherever met with, and it is more than possible that the bigger rivers, such as the Jumna, may have a similar effect. At the same time, the Lesser Florican does surmount some Hill ranges, for they migrate into the Valley of Nepal, as already recorded, and it has been shot on the Nilgherries as well.

The Likh, or Lesser Florican, is not gregarious like those Bustards with which we have already dealt. In suitable country, of course, many birds may be met with in the same extent of grass land, but they will be found at some distance apart, never in flocks, and though sometimes in pairs yet more often singly, except in the breeding season.

This little Bustard, according to Jerdon, "frequents long grass in preference to any other shelter. It is, however, often to be met with in green fields, in fields of Cotton and Dhol, and, in the Carnatic, so much in those of the grain called *Warragoo*, as to be called in Tamil, *Warrago Koler*, or *Warragoo Fowl*."

All other writers agree with the above; Hodgson adds hill rice to the crops they frequent and Hume says that they are often found in millet fields, other sportsmen have written to inform me that they have shot them out of bajra, Indian corn, wheat and even young sugarcane. Inglis also informs me that in Behar they are sometimes put up in the indigo fields which affords them good cover.

In fact, the Likh may be found in any crop which is dry under foot, not too dense to make walking difficult and not too high, but preferably they keep to grass land or to grain fields into which they are tempted to feed.

Unfortunately the Likh has a habit during the breeding season of jumping into the air to attract the opposite sex and this has led to its undoing. All the writers quoted by Hume mention this habit and its disastrous effects and Hume himself says. "Owing to the unsportmanlike manner in which these beautiful birds are massacred during the breeding season, they are everywhere diminishing in numbers and will, in another half a century, be, I fear, almost extinct." Mr. J. Davidson also recorded that year by year he noticed a diminution in their numbers in the Deccan. They are not yet extinct, nor have their numbers decreased to the extent Hume feared, but there can be no doubt that everywhere the Lesser Florican is less common now-a-days than it was when Hume wrote in 1879, thirty-two years ago.

Davidson, describing the way they are killed, writes, "Florican are found sparingly in Mysore, but I only saw one on two occasions in the Tumkur District, during last year. It is a migrant during the rains to Western Guzerat where it is remorselessly shot down while breeding, but apparently avoids the Panch Mahals almost entirely; at least only one specimen has been secured there during the last few years.

"They are ordinarily shot in the Deccan in the long grass bhir, being flushed by a line of beaters, the guns walking along with the beaters. In the breeding season the cocks are sometimes shot in the following way:—In the early morning the gunner, *for one can hardly call him a sportsman*, goes to a bhir, where he knows there are birds, and waits till he sees one jump up in the grass



A. BEATER IN CUTCH WITH LESSER FLORICAN OR LIKH (*Sypheotis aurita*).



B. FEMALE LESSER FLORICAN ON NEST.

and cry. He then stalks within 50 or 60 yards, and again waits till the bird jumps and then runs as fast as he can towards the spot. The bird generally rises 30 or 40 yards off, and there is a fair amount of excitement if not of sport, in shooting them in this way."

Capt. Butler gives a similar description as follows:—"For my part, I have always protested against the wholesale destruction of these fine birds in the breeding season, and tried very hard when I was in Deesa, to persuade sportsmen (!) to spare the hens. But it was of no use; they argued that, 'if they didn't shoot them, some one else would,' and consequently the Florican were shown no mercy.

"The usual method of shooting them is to walk them up in line, when they rise usually within easy shot. They are easily killed, and I have seen longer shots made at Florican than any other bird I know. In fact they drop if you fire at them at almost any possible distance (provided, of course, you hold the gun straight). At times, however, after being marked down, they are very difficult to find, as they commence running the moment they alight, and often get 200 or 300 yards away before you reach the spot where you have marked them down. But for this, scarcely a bird would escape."

Again, Mr. James says:—"The ordinary way in which a single gun pursues Florican is to walk through the grass, with a few beaters, listening for the cry of the bird and following it; in this way the bird can be tracked for a considerable distance. Before very long the bird will be seen jumping up above the long grass, as some think to pick grass hoppers off the stems. The best way then is to run as hard as possible up to the place when the bird will rise. They drop very easily to shot, but when once flushed are difficult to flush again."

All writers and sportsmen seem to concur in considering the Lesser Florican to be much less wild in its nature than any other Bustard and when in fairly high grass or crops they often lie very close, not rising until the line of beaters approaches within a few yards of them and seldom rising more than 30 yards in front of the line. Jerdon says that "it feeds chiefly in the morning and is

then easily raised but during the heat of the day it lies very close and is often flushed with difficulty. I have known one instance of one being killed by a horse stepping on it."

On some occasions, however, even this bird lives up to the general reputation of its family for wariness. Jerdon himself admits that such a bird is sometimes met with and Hume says that in the cold weather when in short grass or young crops they are about the most difficult bird he knows to get near.

As might be expected the Likh is rather a favourite bird with Falconers; its habitat, its powers of flight and the ease and frequency with which it is found all combining towards this. Jerdon writes: "Its pursuit is consequently a favourite sport, and from the open nature of the ground it frequents, it is well adapted for being hawked. I have killed it occasionally with the Luggur, but generally with the *Shaheen*, and have already given an account of the manner of hunting it. Should the *Shaheen* miss her first stoop, I have seen the *Florikin* accelerate its speed so greatly, that the falcon was unable to come up with it again under 600 yards or so. I have seen one struck dead by the *Wokhab*, *Aquila vindhiana*. I had slipped a *Luggur* at it, which was in hot pursuit, though at some little distance behind, when two of these Eagles came down from a vast height, and joined in the chase. One of them made a headlong swoop at it, which the *Florikin* most skilfully avoided, only, however, to fall a victim to the talons of the other, which stooped almost immediately after its confederate, and dashed the poor bird lifeless to the ground. It had not, however, time to pick it up, for I rode up, and the Eagles soared off most unwillingly, and circled in the air long above me. The *Florikin* had its back laid open the whole length." (Jerdon's Ill. Ind. Orn. lc.)

It would seem a favourite prey of wild as well as tame falcons and eagles, for Hume also says that one of the very few specimens he obtained in the Etawah District was killed by a Bonellis Eagle after he had flushed it.

The flight of the *Sypheotis aurita* is much like that of other Bustards, but the wing strokes are rather quicker. Blanford says: "It flies well, with a quicker flight than other Bustards, having, when flying, a slight but peculiar resemblance to a duck." By

“quicker flight” Blanford probably refers to a quicker wing movement and not actually to a faster flight, for the flight of the Likh is certainly not as fast as that of the bigger birds of this family.

When flushed it often flies a considerable distance and is then very hard to put up again, as it either squats close, allowing a line of beaters to pass over it, or it runs to a great distance and eventually rises far from where it was seen to alight. It is very strong on the leg and makes its way through thin grass or scrub jungle at an almost incredible rate, far faster than a sportsman can walk. Jerdon notes that “when walking or running it raises its tail, as is represented on the drawing, the lateral feather diverging downwards, whilst those of the centre are most elevated, as is seen in domestic fowls, etc., forming what Swainson calls an erect or compressed tail.”

The voice of the Lesser Florican during the breeding season is said to be a harsh croak, this being indulged in by the bird during its nuptial flights. The voice of the hen at this time is described by Wenden as “a low clucking cry” but whether this differs from that of the male or not he does not say. According to Jerdon “it is said to have a feeble plaintive chirp or piping note when running or feeding” and he also says that when flushed it utters a kind of sharp quirk or note of alarm.” A personal friend of mine, who has spent much time watching these birds, gives them credit for a rather large vocabulary. He remarks *in epistola*: “These Floricans have many notes besides the drum or croak they give vent to in the breeding season. When moving about feeding they constantly utter a low chuckle and also the chirp or piping note referred to by Jerdon. Males and females also call to one another in a croak like that just mentioned, but softer and lower.”

The Lesser Florican not only suffers from the so-called sportsman who persistently shoots it throughout the breeding season, but they are also much persecuted by native snarers and bird-catchers wherever and whenever they appear. Col. Fenton writes to me that he never came across these bird-catchers in Kathiawar, but that in the Deccan “the *phansi padees* or professional snarers never gave the birds any rest, and it is not surprising if they have

diminished of late years." Mr. James records the same in Hume and Marshall in which work he is quoted as saying "*Pardis*, the professional poachers of the Deccan, snare them along with Partridges and Quail, simply by setting a rope of snares down the grassy bank of a dry nullah and then beating the bushes."

The principal food of the Likh consists of grasshoppers and in catching these, and other insects, it often hops into the air after them, catching them on the wing. No insect comes amiss to it and it will feed freely on Cantharides, beetles of all kinds, worms, centipedes and even, when hard pressed, small lizards, frogs, etc. It is also largely a vegetable feeder, eating both ripe grain and tender shoots of young crops and grasses as well as many kinds of berries and young herbs.

Its flesh is generally held to be excellent, though Hume says it is not as good as that of its larger first cousin, the Bengal Florican, and compares its flesh to that of the Blue Pigeon. The food it eats naturally affects its eating qualities and one sportsman may eat it at one season of the year and find it almost unpalatable, whilst another, a little later, may find it just the reverse. Jerdon thought that "its flesh is very delicate and of excellent flavour and it is the most esteemed of all the Game Birds." Mr. James writes, *vide* Hume, "It is perfectly true that sometimes the effects caused by eating Floricans' flesh after they have been feeding on blister-flies is most painful and disagreeable. I myself have suffered from this cause."

The breeding season of the Lesser Florican varies much in different localities. Jerdon says that some birds breed in Southern India from July to November and that he has put the hen bird off her nest in August in the Deccan and in October near Trichinopoly, and he also says that he has heard of hens being found sitting as late as January. Hume says that the majority breed in September and October and this agrees with the observations of most other observers in the more northern of their breeding haunts. As regards Kathiawar, however, it would seem that they commence rather earlier. Colonel L. L. Fenton writes me: "Only an occasional bird is to be seen at any other season of the year, but about the end of June they arrive in great numbers in the Kathiawar

Vids for the purpose of breeding. The large *Vids* round Rajkot, such as Kalipat, Kotaria, Ghanteshwar, Damalpur, etc., are celebrated for them at this season of the year, and I have here seen over twenty birds in one morning."

"There seems always to be a preponderance of cock-birds, but perhaps they are more in evidence than the hens, owing to their habit of jumping, and hens are, I think, at all times more difficult to flush than are the cocks. I cannot say where the greater number betake themselves after the breeding season is past, but it is an undoubted fact that very few remain in the Province, as they are rarely met with in the cold weather."

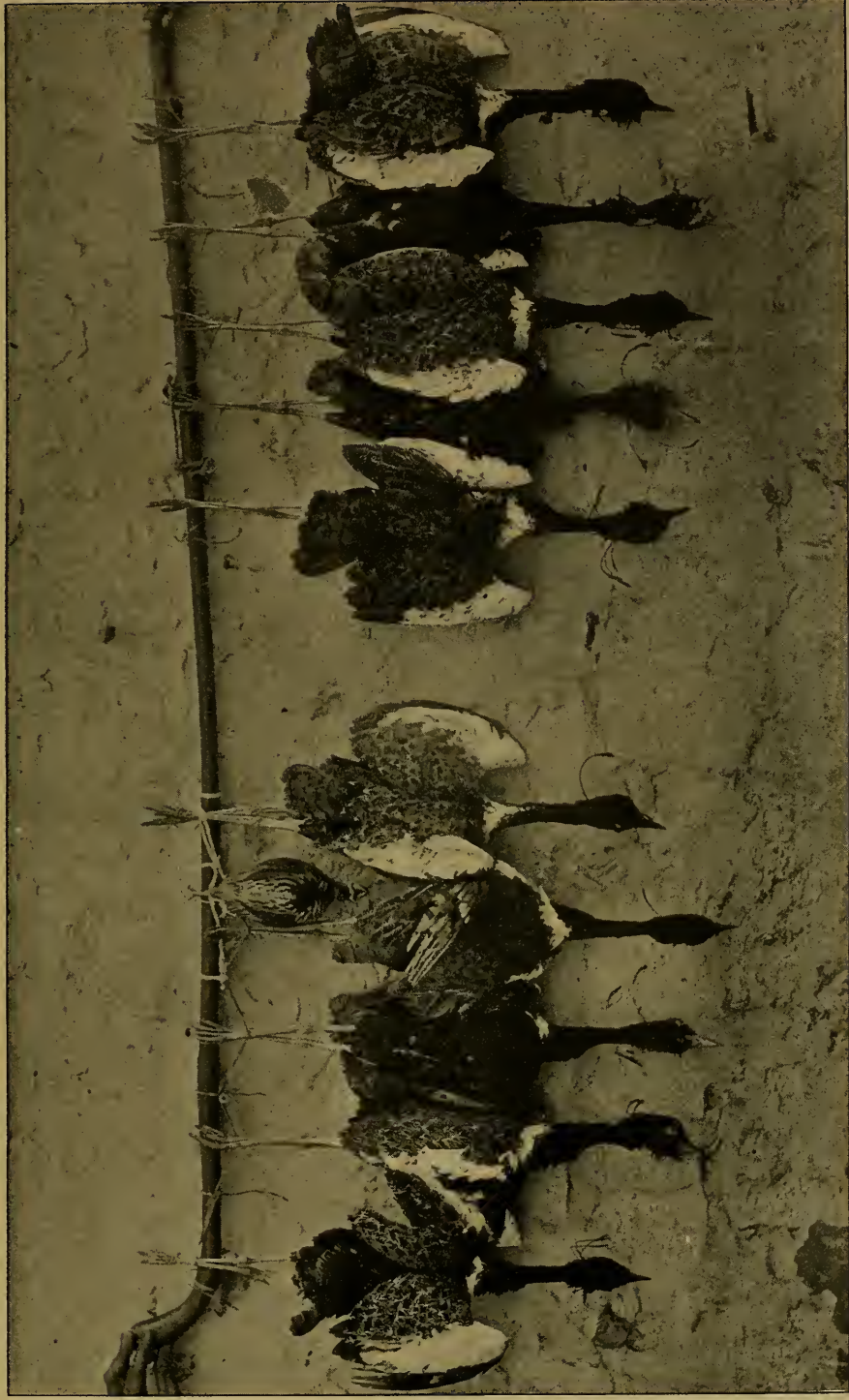
Allusion has already been made to the curious habit displayed by this bird of jumping into the air, to some height above the surrounding vegetables, in order to attract the notice of the opposite sex. Generally it is the male alone which resorts to this trick, but sometimes, at all events, the female also does indulge in it. Hume himself says that he has seen the female jumping, though he adds that this is only for the purpose of catching flies, etc., as they are disturbed from the grass. Mr. Wenden, however, whom Hume quotes, distinctly saw the female bird as well as the male jumping, and thus describes his experience—"On the 16th I went out and watched this bird for more than an hour, just about the time at which she had been flushed on the morning before from the single egg. From the tree on which I sat, with my binoculars, I saw her running rapidly out of the dense preserve, across the open and into the scanty patch in which was her egg. Here she moved about for some minutes feeding, and every now and then sprang into the air with a low clucking cry, which was answered by the male bird from the preserve, though at first I could not see him. Then as though a sudden thought had struck her, she darted to the nest, and after one or two springs, and walking round and round the egg, she squatted and deposited another. While she sat, she was quite silent, but the male bird, who had now advanced closer to me, kept springing in the air and crying continually. The operation of laying the egg seemed to last about twenty minutes—*i.e.*, from the time she sat to the time she rose and having made another spring or two walked round the

eggs ; she then made straight tracks for the dense grass where the male bird was calling.

“ I went out quite alone on this watching expedition, and all was quite quiet, and the birds were at their ease ; but while I was still in the tree, a man came into the preserve with some cattle, and then I saw both birds spring several times *silently*, and after that I saw or heard nothing of them. ”

Mr. Davidson also describes this quaint habit at some length ; he says: —“ The Florican breeds all round Sholapur, in considerable numbers, wherever there are grass preserves with long grass. During the breeding season they seem chiefly to haunt the thinnest patches of long grass rather than those full of small bushes ; they are at this period exceedingly difficult to flush, particularly the hens, which, even if you succeed in forcing them to rise, get up only at your feet and make but very short flights. The cocks are not quite so difficult to flush, but you are obliged to run towards them, to get even *them* up : if you simply walk after them they will rarely rise. Their whereabouts are, however, generally easily discovered by their frog-like call, and their occasional sudden jumps up into the air. They do not seem to call much when the sun is bright, but chiefly in the morning and during cloudy days. I have often watched them flying or jumping up, but I am still uncertain why they do it. My original impression was that they sprung up to seize insects from the grass stalks, but I have long abandoned this idea, as they rise much above the grass. Moreover, I have only seen one bird thus rise that could have been a female and this was dark-coloured, and probably a male that had not assumed breeding plumage, and I am inclined to consider these sudden flights as simply one of those bridal displays so common in the males, especially of gallinaceous birds, such as the flapping of the wings in Pheasants, the nautch of the Peacock, the lek of the Capercaillie, and the pouch-inflated strut of the big Bustard, and if it can be certainly established that this habit is confined to the males no alternative solution seems open to us.”

The Lesser Florican is unlike most of its family “ in India at all events ” in that it is monogamous, whereas the others are either polygamous or “ promiscuous ” and the male is said to remain with,



A BAG OF LESSER FLORIOAN OR LIKH (*Sypheotis aurita*).

or near, the hen even after incubation has begun. Although this seems to be a generally accepted fact, there are a good many points which would seem to be against it. In the first place male birds which display *continually* throughout the breeding season seldom keep to one wife for the whole period, nor as a rule are monogamous males as pugnacious as are polygamous birds. Jerdon's description of the display and pugnacity of the Likh certainly look like attributes of a polygamous male. He writes: "The full and perfect breeding plumage is generally completed during July and August. At this season the male bird generally takes up a position on some rising ground, from which it wanders but little, for many days even; and during the mornings especially, but in cloudy weather at all times of the day every now and then rises a few feet perpendicularly into the air, uttering at the same time a peculiar low croaking call, more like that of a frog or cricket than that of a bird, and then drops down again. This is probably intended to attract the females, who before their eggs are laid, wander greatly; or perhaps to summon a rival cock, for I have seen two in such desperate fight as to allow me to approach within thirty yards before they ceased their battle."

The Bengal Floricans, males and females, undoubtedly do *not* pair at all, and the male is neither polygamous or monogamous, yet its courting displays are identical with those of the Lesser Florican as is the habit of the male of displaying in one particular spot whilst the females wander about the country. It is probable, therefore, that when we come to know the domestic habit of *Sypheotis aurita* more intimately they will prove to be similar to those of *Sypheotis bengalensis*.

The Lesser Florican makes no nest in which to deposit her eggs, nor does she, as a rule, even trouble to find or make a hollow for this purpose merely depositing them on the ground in some small bare patch in a field of grass. The grass field selected is seldom one of any very great size or having dense growth in it and the bird seems to prefer small pieces of grass of some two feet or so high and of scanty growth. The bird watched by Mr. Wenden deposited its eggs "on the bare ground, which was perfectly level (without the least signs of scratching) in some

thin scanty grass, about 2 feet high and about 2 yards in from the edge of the grass patch. Not a hundred yards from the plot of grass in which the eggs were deposited was a preserve, over a mile long by a quarter broad, of very high dense grass, a far more likely place, one would have thought, for so wary a bird to lay its eggs."

When the bird does lay its eggs in a vast stretch of grass, as is sometimes the case in Kathiawar, it is said almost invariably to choose some part where the grass is shorter and more scanty than elsewhere and also often to make use of some bare spot close to the outskirts of the field.

The nest, found by Mr. Wenden, contained three eggs, one found in it on the 15th, one laid on the 16th and the third on the 18th; this corresponds with what we should expect and with what I have heard from other observers and it seems, therefore, fairly certain that the species lays its eggs on alternate days.

As a rule the full clutch of eggs consists of four, but often only three are laid, sometimes but two and very rarely five. I have never seen a clutch with five eggs myself, but Lieut. F. Alexander recorded that this number was sometimes laid and Mr. James once found five chicks together.

In shape the eggs are typically very broad ovals, more spherical than those of any of the other Bustards; but for this they are hardly distinguishable from those of the Lesser Bustard, *Otis tetrax*, though on an average they seem considerably smaller. For instance the average size of the 26 eggs of the Likh in the British Museum collection is $1.82'' \times 1.6''$ (=about 46×40.6 mm.), whereas the 23 eggs of *Otis tetrax* measure $2.07'' \times 1.51''$ (=about 52.6×38.2); these figures shewing well the difference in comparative shape and size in the eggs of the two species.

Hume gives the average of twenty-three eggs as $1.88''$ nearly by rather more than $1.59''$ ($=48 \times 40.5$ mm.) and the average of 18 eggs which have passed through my hands and are not included in any of the above is $1.84'' \times 1.6''$ ($=46.8 \times 40.3$).

The surface of the shell is very smooth, though pitted with tiny pores, and there is always considerable gloss, very highly developed in many cases. The texture is fine and very close.

Hume thus describes his series of eggs now in the British

Museum. "The eggs like those of the Great Bustard (which, though smaller, they greatly resemble), vary much in size, shape and colouration.

"Typically they are very broad ovals, with a feeble tendency to a point at one end; but some are nearly sypherial, some are purely oval, while one or two approach a Plover shape.

"The shell, everywhere closely pitted with miniature pores, is stout but smooth, and has always a slight, and at times a brilliant gloss.

"The ground colour varies from a clear, almost sap green, through various shades of olive green, drab and stone colours, to a darkish olive brown. I have seen no specimens exhibiting the blue and bluish grounds occasionally met with in the eggs of the Great Indian Bustard."

"The markings are brown, reddish or olive brown, occasionally with a purplish tinge, in some very faint and feeble, obsolete, or nearly so, a mere mottling, in others conspicuous and strongly marked; but in the majority neither very faint nor very conspicuous. In character they are generally cloudy streaks, more or less confluent at the broader end (from which they run down parallel to the major axis) and more or less obsolete towards the smaller end. Occasionally, however, they are pretty uniformly scattered over the whole surface of the egg."

"In size the eggs vary from 1.77 to 2.06 in length, and from 1.5 to 1.7 in breadth; but the average of twenty-three eggs is 1.88 nearly, by rather more than 1.59."

The eggs in my own collection agree well with the above but there is one pair which deserves separate description. These have the ground colour a most beautiful green grey, very pale and almost silver in tone. The markings are as described by Hume, but are unusually bold and stand out conspicuously on the pale ground, making them both very handsome.

* The two photographic plates in this Number and the one of the Houbara at page 330 in the last Journal, are from photographs taken by H. H. the Rao of Cutch, a sportsman with an intimate acquaintance with these birds and their habits and one who has supplied me with many interesting details regarding them.

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA

(INCLUDING THOSE MET WITH IN THE HILL STATIONS
OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

PART XI.

(Continued from page 544 of this Volume.)

FAMILY—PAPILIONIDÆ—(continued).

89. *Papilio crino*, Fabr.—Like *P. buddha* but with the green discal band much narrower, especially on the forewing, the male has, generally, woolly scent-streaks on outer portions of veins 2 to 4 of forewing. Forewing in male and female with the transverse, discal band bluish-green, slightly sinuous, curved, narrow, increasing in width from costa to dorsal margin; more sinuous in the female. Hindwing with the band variable in width, but much broader than on forewing, continued above vein 7 to costa but much narrowed abruptly in that interspace; tornal ocellus claret-red with a large black centre inwardly edged with blue; a sub-apical whitish spot; subterminal diffuse, green lunules in interspaces 2, 3, 4: the spatular apex of tail with a patch of bluish-green scales. The whole upperside is irrorated on both wings with brilliant green scales but much less densely than on the basal area of the wings of *P. buddha*. Underside dull pale brown to blackish brown, irrorated with scattered, yellowish scales which, however, on the forewing are absent from a large, triangular, discal patch that lies between the dorsum, the median vein, vein 5 and a line of white lunules that crosses the wing in an outward curve from the upper third of the costa to just before the tornus; these white lunules are outwardly diffuse and merge gradually into the brown ground-colour. Hindwing: the tornal ocellus much as on the upperside; an obscure, ill-defined, highly arched, postdiscal, narrow, whitish band from above the tornal ocellus to the costa ending near apex of interspace 7 in a broad, white lunule; beyond this a double sub-terminal row of somewhat straight, ochreous-white lunules in the interspaces, each lunule of the inner row bordered outwardly with blue, this bordering very faint in some specimens. Cilia of both fore and hind wings brown alternated with white. Antennæ, head, thorax and abdomen dark brownish black; the head, thorax and abdomen above with a sprinkling of glittering green scales. Expanse 100-116 mm.

Larva.—"Somewhat limaciform; anterior segments convexly scutellated; furnished with a pair of short, fleshy tubercles on anterior and two on anal segments." (Moore.) "Colour bluish-green." (Dr. K. Jordan.)

Pupa.—"Curved backward anteriorly; head broad in front; green." (Moore.) From these descriptions of the larva and pupa may be gathered that they are very similar to those of *P. buddha*.

Habits.—There does not seem to be any record of the habits of the larva, but it is not probable that it differs as regards its ways from that of *P. buddha*. The imago is also not likely to differ from that species as to choice of the style of country it inhabits though it does not seem to be found below 2,000 feet above sea level. It has a peculiar distribution but it is difficult to say to what this may be due. It exists in Lower Bengal, in the Central Provinces, South India and Ceylon. It has not been found anywhere in the Bombay Presidency up to date but occurs in the Nilgiris. It is said to be "rather common in the Plains, especially in the Spring, in Ceylon, but also occurs in the mountains up to about 6,000'. The flight is very swift." (Dr. K. Jordan.) The foodplant is given as "*Chloroxylon*" by Dr. Jordan. It is fairly certain to be *Chloroxylon Swietenia*, DC., a member of the family of the *Meliaceae* to which the Neem belongs; it is known as the Indian Satinwood tree and grows to a large size in Ceylon which is probably the place Dr. Jordan's information was obtained. This foodplant gives an indication of the sort of habitat the insect affects. The tree is found in dry, hot parts of the Bombay Presidency such as Bijapur, Dharwar and the east of Belgaum though the butterfly has never been, as stated above, yet noticed in any of these places. In Ceylon also it is limited to the dry regions. Its distribution is said to be the deciduous forests of the Western Peninsula as far as the northern edge of the Satpura mountains running between the Narbaddha and the Tapti rivers; but it is more than probable that it occurs further north-east, extending through Chutia Nagpur into the Behar Hills and, possibly, still further north up to the Ganges, on the Rajmehal Hills; and this simply because *Papilio crino* is found in Lower Bengal; that is the occurrence of the butterfly there is certain to indicate the existence of the foodplant of its larva. This is not the only interesting botanical inference which may be drawn from the entomological fact.

Besides the question of distribution there is also a question of the affinities of the foodplant, *Chloroxylon*. It has been stated that the larvæ of the genus *Papilio* in India or, to narrow the question down further, of the genus as composed of the groups of *Papilio* mentioned in these papers more particularly, feed upon plants belonging to certain well-defined botanical families, each group being absolutely limited to one family in particular. These families are *Anonaceæ*, *Rutaceæ*, *Aristolochiaceæ*, *Lauraceæ*, all with aromatic leaves which make it easy enough as a rule to place them where they botanically belong. The Satin-wood is generally placed by botanists in another family, the *Meliaceæ* where, evidently, the butterfly thinks it should not be. It has been mentioned before, also, that *Papilio demoleus* larva was once found on this plant in the Bijapur District of the Bombay Presidency; causing, at the time, considerable surprise as the foodplants of that larva were, as evinced by thousands bred in different localities at all times of the year, all rutaceous. This led later to enquiry into the affinities of the plant which, probably owing to ignorance, ended in no definite result until the following statement presented itself in Brandis' "*Indian Trees*", viz.: "Engler in Engler u. Prantl iii. 4, 171 places *Chloroxylon* under *Rutaceæ* chiefly on account of the translucent glands in the leaves, which form one of the distinguishing characters of that order." From which, backed up by a careful comparison of the descriptions of *Chloroxylon* with some of the genera of *Rutaceæ*, the probabilities are that *Papilio crino* knows more about real affinities in plants than botanists—except Engler.

There are butterflies of the same sort as *buddha* and *crino* in Burma and the Malayan Region. *P. palinurus*, F. from Burma, Malay Peninsula, Sumatra, Borneo and Banguay Island is like the former but has the band on the hind wing narrower and is generally smaller; it has subspecies in Palawan (*angustatus*, Staud.) and in the Phillipine Islands (*dædalus*, Feld.); *P. blumei*, Boisd. is a fine species inhabiting Celebes, with rather broad blue-green bands to both wings and blue-green tails. The green of our two species shows peacock-blue in certain lights, violet in others; when flying in the sun it appears always very brilliant metallic green.

90. *Papilio buddha*, Westwood.—Male *upperside*: black, closely irrorated with brilliant green scales, the basal area up to the discal green band much more closely than elsewhere. Forewing with a very slightly excurved, oblique, bright green discal band that extends from the middle of the costa to the dorsum well before the tornal angle; measured on the dorsum the width of this band is more than one-third the length of the dorsal margin; anteriorly it passes through the apical third of the cell and is narrowed slightly at the costa; the irroration of green scales beyond this band is much thinner than at base of wing and is confined to a triangular patch from apex of wing downwards along terminal margin. Hindwing with the median third beyond the basal irroration occupied by an outwardly curved, brilliant green patch interrupted by vein 6, in continuation of the band of forewing, reaching the dorsal margin and slightly narrowed at both ends (sometimes it is slightly produced into interspace 7), its outer margin diffuse; this is followed by a subterminal series of ill-formed green lunules traversing the outer black area which is, including the tails, otherwise devoid of green scales. The costal area beyond vein 6 is dark brown with a subapical bright ochraceous lunule. Finally there is a tornal ochraceous ocellus centred largely with black. Cilia of hindwing brown, alternated with ochraceous. *Underside* softly brown-black; bases of both fore and hind wings somewhat thickly, the outer portions more thinly, sprinkled with pale yellow scales. Forewing: apical half obliquely pale brownish white, darkening to dusky blackish at apex and narrowly along termen; the pale area narrow at termen, gradually broadened up to the costa, traversed by the black veins. Hindwing: uniform; an outer pale terminal band traversed by a subterminal series of ochraceous lunules bordered on both inner and outer sides by velvety black (hardly at all on the inner sides), the inner side further bordered conspicuously by silvery white; the lunule in interspace 7 much larger and bolder. Antennæ, head, thorax and abdomen velvety black, the head and thorax above irrorated with green scales. Female differs from the male in having the tails broader and, generally, in having the subapical ocellus of the hind wing larger. Expanse 92-102 mm; sometimes larger. The male about equal to the female.

Egg.—The egg, laid generally on the top of a leaf, is light lemon in colour at first, but soon gets a broad rusty band round the centre with a darker, irregular, rusty line in middle of band, the summit of egg with a rusty (colour of darker line) large patch. In shape it is spherical; the surface is slightly shiny and obscurely frosted-rough. Diameter 1.3 mm: very small for the butterfly.

Larva (1st stage).—The head is round covered with short, black hairs and is coloured translucent very light buff, slightly darker on each side near the apex of clypeus; eyes black; clypeus large. The shape of the larva

is the same as that of the larva of *Pap. polymnestor*, &c., at the same stage. Dorso-lateral tubercles of segments 2 and 13 are long, conical, fleshy; dorso-laterals of segments 3, 4, 5 and 12 are about half the size and exactly similar; those of segments 6 to 10 are half as small again as those last mentioned and rather cylindrical; there are no sub-dorsal tubercles except one at the base of the dorso-lateral of segment 2; supra-spiracular-tubercle of segments 3 and 4 as large as dorso-lateral of same segment and similar to it, those of segment 4 possibly the larger slightly; spiracular tubercles disposed as usual, very minute with 2 or 3 black spines. Surface dull. Colour a livid greenish-yellow with a very dark olive-green dorsal band from segment 3 to 11, covering the whole dorsum of segments 3, 4 and 5, becoming a mere line on the last segments; a broad lateral band of same colour from segment 5 to 12 with a thin line of the body colour running down the middle; belly and base of legs dirty greenish; segments 2 and 13 with the tubercles light greenish-ochreous; all the tubercles shiny translucent and all the spines on them (with the exception of the spiracular spines of which are black) are yellow. L: about 4.5 mm. with tubercles; B: 1.25 mm. without tubercles and 2.25 mm. with at broadest part which is segment 4.

2nd stage.—Is very similar to the same stage of *P. tamilana*: the sub-dorsal tubercular spots only exist near the front margin of segt. 5: on no other segment; the subdorsal, small, fleshy, spined tubercles at base of laterodorsal tubercles of segment 2 still exist: the laterodorsal fleshy, conical tubercles exist on front margin of segment 2, hind margin of segment 13, in centre of segments 3, 4, 5 and 12 though these central tubercles are much shorter than the marginal ones of segments 2 and 13; the dorsolateral tubercles of segments 6 to 11 are very small, central, spined like all the rest; the supraspiracular tubercle of segment 4 is little smaller than the dorsolateral tubercle of segment 2 and the supraspiracular tubercle of segment 3 is in size between these last two; the supraspiracular of segment 2 is nearly the same size as that of segment 3: the supraspiracular tubercles of segments 5 to 12 and the other spiracular tubercles of all segments are mere spots with one or two hairs on them. The head is yellowish and is covered with minute erect sharp hairs which are black but not densely; the head is suffused with brown on upper part of the clypeus; which is of ordinary size, triangular, and along the margins bounding the clypeus; is roundish, very slightly bilobed, shiny. The surface of larva is shiny and covered sparsely with minute black hairs on segments 2 to 5. Colour of larva is rather dull olive green, the spiracular region greyish, a lateral greyish line; a rather broad subdorsal whitish region on segments 6 to 11; segment 5 marked yellowish in its hinder half, this marking being continued along the lateral region of segments 4 to 2 as far as head; there is a dark spot or patch just below lateral greyish line on segments

6, 7 and 8; base of large tubercles of segment 13 strongly ochreous, the base of those of segment 2 less so, the rest transparent greenish; all the spines of tubercles whitish. L: 10mm; B: 3mm. at segment 4 without and 4mm. with tubercles.

3rd stage.—The larva has lost the dorsolateral tubercles of segments 6 to 11 completely, but has those of segments 2, 3, 4, 11, 12 still, those of segments 2, 11 and 12 as large as ever, those of segments 3, 4 mere knobs; the supraspiracular segments of segments 3 and 4 are still there, the former about half the size of the latter and the latter smaller than dorsolaterals of segment 2. All signs of supraspiracular and spiracular tubercles completely gone. Head is greenish and covered with extremely minute hairs. Surface of body is only slightly shiny. Colour is dark green with an irregular spiracular white line, a white band along base of legs, the space between marked whitish, the tubercles ochreous, a yellow line joining bases of supraspiracular tubercles of segments 4, 3 to base of dorsolateral tubercle of segment 2, and a maculate light yellow broad band from base of supraspiracular tubercle of segment 4 on one side runs back and along hinder margin of segment 5 over dorsum to supraspiracular tubercle of segment 4 on the other side; a yellowish small patch on the common margins of segments 6/7, 7/8, 10/11 dorsolaterally with the margin thinly yellow between over dorsum; some indistinct yellowish spots all over. L: 15mm. at rest by B: 5mm. at segment 4 and 5mm. with tubercles.

5th or last stage. (Pl. 1, Fig. 15).—The larva in shape and general appearance is very like that of *P. tamilana*. The head is light green, the eyes black; and is of the usual shape. Segments 2 has the front margin straight with a small tubercle at each end of it; the dorsolateral tubercle of segments 12 and 13 also remain, those on the former minute, on the latter as large as those of segment 2. Spiracles rather small, coloured like the body with linear whitish centres. Surface smooth and dull. The colour of the larva is dark green, spotted finely with light yellow; a subspiracular yellow band from segment 6 to segment 12; a distinct subdorsal row of tubercle-like yellow spots on segments 7-12; a transverse row of yellow spots near front margin of segment 4 ending on each side in an indistinct ocellus or eye which, however, may occasionally be distinct and black—this row of spots representing the front crest of the *P. tamilana* caterpillar; on segment 5 is another transverse crest near hinder margin with a thick spotting of light yellow continued under the ocellus forwards by a narrow yellow band or line up to the base of the tubercle on front margin of segment 2. The space enclosed between the two crests and this band or line is oval in shape, longer than broad and is often called the "shield"; it is somewhat flattened and often greyish looking ventrum, anal flap and legs watery greenish white. L: 46mm; B: 10mm. at the broadest part which is segment 5.

Pupa (Pl. 1, Fig. 15 a.)—Is very like that of *P. tamilana* in shape and colour; except that, as regards the shape, the dorsal line is much straighter, the front part formed by segments 1-5 not being thrown back at such an angle as in that species; the thorax is slightly less humped, the headpoints are longer: nearly as long as they are in the pupa of *Papilio pamon*. There is a very slight carination in the dorsal line from segment 2 to cremaster. Spiracles small, oval-linear, the same colour as the body of pupa. Surface dull and more or less smooth. Cremaster strong and square at end. Colour dark green ventrally much lighter dorsally to approximate to the upper and underside of the leaf of the plant it feeds on; dorsal line, dorsoventral line from cremaster to shoulders and ventral suture-line of wings, all yellow; there is a subdorsal jet-black spot on segments 6. L: 32 mm: L: 10 mm. at middle.

Habits.—The egg is laid on young shoots, or on the top of an old leaf in the monsoon months. The larvæ prefer leaves that are not too young as food; they lie in the centre of the upperside of leaves on a bed of silk, separately of course: that is, never more than one on any one leaf; and the yellow speckling of their skins makes it difficult to see them as the leaves of the foodplant are very similarly marked with spots produced by the agency of some insect. The pupa is almost invariably formed on the foodplant, hanging from, and attached to, a twig or twig and leaf—midrib with a moderately long body-band and strong tail fixing; thus hanging with the light coloured back showing to an observer on the ground among the light green leaf-undersides while the dark ventral green, directed upwards, harmonises with the dark green of the uppersides of the leaves to aid in protecting it against detection from above. The osmeteria are reddish in colour but the larva does not often make use of them, that is, it rarely protrudes these scent-organs. The imago is not really a butterfly of the Plains as distinguished from the Hills, though it is perhaps fonder of open scrubby jungle and continuous sun-shine than most other swallowtails. Its habitat is given as Southern India and it seems to be confined to the western coast where it is perhaps commonest in the low hills along the sea, board wherever its foodplant is found; it certainly ranges from sea level up to 2,000 feet. Its range is most probably determined by heavy rainfall. As indicated above, this beautiful butterfly rejoices in the hottest sunshine and in the Kanara District, where it is very fairly plentiful, it offers one of the most

inspiring sights to the active lepidopterist. It is a fast flier and nearly always keeps to the tops of the trees round which it circles in rapid activity. It is consequently difficult to catch; a long net and a quick eye are absolutely necessary to effect a capture. Even then it is nearly impossible without a careful choice of a place of vantage. The best way is to choose a Tirphal tree (the vernacular name of the foodplant in Mahratti) round which the butterflies circulate, with a rock or high place near it and wait until an insect flies within reach; or, better still, choose two trees on a hill side or on uneven ground, one of which is higher than the other and stand between them. The glint of the blazing green of the wings as the insects pass below the level of the eye will generally ensure an amount of perseverance in the chase that should result in ultimate success. Captures are always found to be males, and the reason is difficult to guess, except it were a fact that more of that sex were born than females. This, however, is not the case as has been proved by breeding from the egg and caterpillar. Indeed breeding results in more females than males. Females lay but one egg at a time, and do not take long about it; they fly as fast and as swiftly as males; but no one can say whether they keep it up as long: perhaps they do not, and rest for long periods at a time, but even this would not explain why so few are caught in the net, for there must be thousands and thousands of individuals in any one locality. Female *buddha*, unlike the females of other insects which are also rarely met with and which keep so it is said to the underwood and tree tops in dense jungle, frequents open ground as often as the males and so ought to be visible as often as these. She must fly at a different time to the male; it is the only explanation; and that time cannot be the hottest hours of the day. So little is known about such matters! The larva feeds upon *Zanthoxylum Rhetsa*, DC., mentioned before as one of the foodplants of *Papilio helemus* and has not been found upon anything else. *Zanthoxylum* is a genus of the *Rutaceæ*.

The caterpillar of this most taking insect was first discovered by the late E. H. Aitken, that most genial of men and pleasantest of companions, in the year 1894 in the vicinity of Karwar

on the sea-coast of North Kanara District. He formed one of a combination of three naturalists, who found themselves thrown together in the early '90s in that beautiful spot, and forthwith proceeded to work out the life histories of all the butterflies of the surrounding country. Nearly all the observations upon which these papers are based were carried out there; a large number in those early days of the brotherhood of three, later by two and then, finally, when inexorable circumstances led to mutually regretted separation, by the remaining one. But the early days were the best days for everything was new, and there was unlimited material to work at. Every day brought forth something of interest; every expedition was crowned with abundant success. The larva of *buddha* was much sought after at that time, but had eluded discovery for many months of patient search. The food-plant was known; or, at least, it was taken for granted that it must be Tirphal, for the butterfly was noticed constantly flying round such trees. At last E.H.A. (for those who may not remember him by the initials, it will only be necessary to mention that he was the author of "Behind the Bungalow", "Tribes on my Frontier" and other good books), found a little caterpillar upon a Tirphal leaf and took it home without saying anything about it. He was very excited and hugged the secret from midday until dark that day; but then he could bear the strain no longer and gave it away. There was great rejoicing among the three and every morning, for several weeks after, very tender inquiries were made about its health and progress in growth, or it was inspected with expectant interest. Then one morning it was reported ailing and anxiety was great. Next morning it was dead. That was a day of gloom; but the depression resulted in a firm resolve to seek for more caterpillars and the consequence was that in less than a week, there were half a dozen of all sizes in the breeding cages. The rest was easy.

91. *Papilio antiphates*, *Cram.*—Male and female *upperside*: white. Forewing: cell crossed by five short bands of which the basal extends to the dorsum, the subbasal into interspace 1, the medial and pre-apical up to the median vein and the apical or fifth along the discocellulars; this last extends broadly on both sides of the veinlets and terminates at the lower apex of the cell; beyond these are broad, postdiscal and terminal, black,

transverse bands from costa to tornal angle; the two bands coalesce below vein 4 and terminate in a point at the tornus; the white portions of the cell anteriorly overlaid with pale green; short, macular, hyaline green bands between the black, cellular, apical band and the discal band and anteriorly between the latter and the terminal band. Hindwing: basal three-fourths uniform white with black markings on the underside that show through by transparency; terminal fourth dark grey traversed by a curved, irregular, subterminal series of black lunules that ends in a black tornal spot and a terminal, black band that follows the indentations of the wing; the emarginations below the black, terminal spot edged with ochraceous; the tail blackish grey, edged and tipped with white. *Underside*: forewing similar with similar markings, but the green shading over the white portions in the base of the cell more decided; the discal and terminal, black bands separate, not joined posteriorly, the former edged posteriorly on both sides with dark grey, due to the black on the upperside that shows through by transparency. Hindwing: basal half green, the outer half white; a large black, tornal spot; a black line along the dorsum that curves above the tornal spot outwards to vein 2; a straight, subbasal black band from costa across cell that terminates at vein 2, joining the dorsal black band; a broader, black band from costa across apex of cell extended into base of interspace 3; an irregular, discal series of black markings curved inwards posteriorly towards the tornal spot; a subterminal series of very small, slender, black lunules in pairs (variable in size and distinctness), the ground-colour on the inner side of these darkened to rich ochreous yellow; lastly, a series of short, terminal, black bars in the interspaces so arranged as to follow the indentations of the termen; tail dusky black, edged with white. Antennae black; head and thorax anteriorly with broad, black, median band, rest of thorax bluish; abdomen white marked beneath on each side by a black stripe.—Expanse 90-104mm.

Larva.—The caterpillar of this species is very like that of *P. nomius* in general facies, especially when young. The head is rather round in shape, drawn under segment 2 in repose; it is green in colour. Segment 2 is little broader than the head and is slightly convex, trapezoidal in contour, with a thin ledge along the front margin. Segments 2, 3 and 4 taken together are truncated—triangular in shape, very slightly convex transversely, the base of the triangle being the hinder margin of segment 4, the truncated apex being the front margin of segment 2; the lateral sides of these segments are nearly perpendicular to the ventral surface, even slightly sloping in towards the legs. The hinder margin of segment 4 is the broadest and highest part of the larva, whence the body gradually decreases in diameter to the cremaster which is somewhat long and narrow, running out at each corner of the truncated end into parallel, rather long, sharp points, one to each corner, separated by a straight line between their bases. The dorsal

half of segments 5-14 is very convex transversely, the sides nearly perpendicular to the ventral surface. Segment 13 is short though quite apparent. Segments 3 and 4 have each a short, sharp, conical, lateromarginal tubercle situated in the centre; segment 2 has a small one at each end of the front margin. Spiracles are oval, black, with a white central slit to each. The surface of the body is covered with hardly perceptible semi-appressed, white hairs; the legs and two end-points are set with somewhat longer erect ones which are brown on the latter and white on the legs; the surface is otherwise smooth and is dull; the segment slightly constricted at margins. The colour of the larva is a darkish transparent looking olive-green speckled thinly with white on the dorsa of segments 5-14, the specklings being arranged so as to form a white dorsal line and a dorsolateral darkish line, a dark diagonal stripe on segments 5-11 running across from one segment to the next succeeding from the centre of the dorsoventral margin of one to the darkish dorsolateral line of the succeeding one; there is a broad, spiracular, white-yellow band, below which there is a deep green subspiracular one followed by a whitish band bordered below by a green one; the legs are watery green; the dorsum of segment 2 is yellowish white with a dorsal green line; the flattened deep green dorsa of segments 3 and 4 are surrounded completely anteriorly, laterally and posteriorly by a yellow-white band and the lateral parts of these segments are suffused with reddish black; tubercles on segments 2, 3, 4 are black. L: 40mm.; B: 9mm. at the broadest part at segment 4.

Pupa.—The pupa on the whole is of the type of that of *P. nomius* though of course there are considerable differences in colour, shape and method of suspension. The head is quadrate seen from above, triangular from the side; eyes only slightly prominent; frons at an angle of 60° to longitudinal axis of pupa; from head the lateral outlines diverge to shoulders, are then parallel as far as segment 4, after which the wings are expanded in a considerable curve rather suddenly, merging gradually further on into the surface of the abdomen about front margin of segment 8; ventrally the wings are only slightly convex along the ventral line: it is very nearly parallel to the dorsal line; the ventral line of abdomen beyond is slightly convex also converging gradually towards the dorsal line towards cremaster; this dorsal line straight from cremaster to the apex of thorax, sloping gradually away from the longitudinal axis of pupa at an angle of about 25° to run out at thorax-apex into a short, blunt point directed forwards at an angle of 45° with that axis; the cremaster is strong, parallel-sided, rather long, lying more or less along the surface of attachment. The surface of pupa is dull and has the following low ridges on it: one circumscribing the frons of head, one along dorsal line of frons and segment 2, produced on to segment 3 as far as the thoracic blunt point, a slight ridge from head to shoulder-point laterally, another, in

continuation, thence to where wings commence to expand and along the expansion-edge, continued along sides of abdomen as far as cremaster; the head-front is flat, segment 2 slightly convex, the abdomen dorsally above the carinæ also flattened on segments 4-8. The spiracles are longly oval in shape and light in colour and are of ordinary size. The colour of the pupa is bright green, with a dorsolateral line on segments 4 to 8 where it merges into the lateral ledge-line of abdomen, yellow; the base of thoracic process or point and this point, the head-ridge and those from it to shoulders with those thence to wing-expansion edges, brown; carinæ of segments 1, 2, 3 broadly flanked with brown, narrowing on front margin of segment 2; segment 2 with a brown linear mark laterally; ventral central line yellow. L: 30mm.; B: at broadest part 10mm.; thoracic point 1mm. long.

Habits.—The egg is laid single on the upperside of a fresh leaf or shoot and is of the ordinary spherical shape, greenish white in colour when first deposited, hardly shiny. The little larva takes to the midrib at once, but nearly always wanders to feed on the edges of other leaves than that upon which it has chosen to make its bed of silk and take up its abode. As it grows it occasionally changes its seat, making a new one, and, finally, when full grown, like most other *Papilio* larvæ, it will occasionally quit the leaf and take to stems and twigs. In the last stage it keeps to shady, well hidden leaves and never lies out in the sun. The larva is sluggish and walks with a halting motion. It pupates against a twig or stem of a plant, under a leaf also, as occasion serves and the body string of the chrysalis is very long. The caterpillar is like that of *P. nomius*, the pupa is of the same type also but differs from that of that insect in some essential points, and is never formed anywhere but in positions above specified; it is always green in colour. The butterfly is a quick flier, not powerful but very graceful, stronger than *P. nomius*, and rises much higher towards the tops of the trees round which it may be seen circling on sunshiny days in the evergreen jungles of Kanara on the Western Ghats. It is most plentiful there in the monsoon months and immediately before and after, while the young shoots of the foodplant are still being put forth. It is a local species, keeping to the moister evergreen forests from sea level upwards and is nowhere excessively common. It comes to flowers like *P. nomius* and, in company with that species, members of the genera *Appias*,

Prioneris, *Catopsilia*, and *P. sarpedon*, *P. egyptylus jason* and, occasionally, *P. dravidarum*, may be seen drinking on patches of damp sand in the beds of nallas and rivers or, after a shower of rain, on the wet mud of roads in the hot, close days that immediately precede the south-west monsoon. It then rests with the wings closed over the back though it exposes them, horizontally outstretched, in the ordinary *Papilio* style, when resting from flight on a leaf. The foodplant of the caterpillar is *Unona Lawii*, Hooker, and it has never been found upon anything else, although there are other *Unonae* where it has been collected. *Unona* is belonging to the *Anonaceae* and *Lawii* is an extensive climbing shrub common in the evergreen forests of Kanara. There are sub-species of this butterfly existing throughout Ceylon, India, Burma and the Malayan Region of which *P. antiplates alcibiades* is the commonest. Typical *P. antiplates* is said by Rothschild to come from Western China and Hainan but Bingham gives it as recorded also from Travancore. It is the butterfly of North Kanara also, where *alcibiades* does not occur. This insect will not be found in the Plains. *P. epaminondas*, Oberthür, with discal black markings on the upperside of the hindwing, comes from the Andamans. *P. androcles*, Boisdl., and *P. doreus*, De Haan, are two very fine species from Celebes.

92. *Papilio nomius*, Esper.—Male and female *upperside*: bluish-white. Forewing: the cell with five broad, transverse, black bands, the basal and subbasal bands produced to the dorsum, the medial band generally extended into interspace, the pre-apical ended on the median vein and the fifth or apical from costa along discocellulars extends on both sides of these and ends at lower apex of cell; beyond the fifth band is a short, transverse, macular band of the ground-colour that terminates on vein 5, followed by a very broad, black, terminal band that occupies about one-third of the width of the wing and is traversed by a transverse, subterminal series of rounded white spots. Hindwing: ground-colour along dorsum and above vein 7 whitish; a streak along the dorsum, a subbasal and an inner, discal, transverse band from costa across cell (sometimes interrupted in the middle), and a very broad, terminal band, black; the former two joined near the tornus by cross, lunular, black marks, the terminal band traversed by a series of slender white lunules; a black spot in interspace 1 above the tornus and another small one at base of interspace 4; the black at the apices of interspaces 2-4 and the lunules of the ground-colour thereon

suffused with grey; tail black, edged and tipped with white. *Underside*: white, the black markings very similar but of a bronze-brown with the following exceptions:—Forewing: extensions below the median vein of the basal, subbasal and median transverse bands crossing the cell, and the inner portion below the vein 4 of the terminal, broad band, black. Hind wing: the inner discal band is broken, irregular and black and is bordered by a series of red spots outwardly edged with black; and, sometimes, faintly on the inside as well, the subterminal series of white lunules are broadly edged on the outside with black; the grey patch on the caudal region is replaced by ochreous grey. Antennæ black; head, thorax and abdomen creamy white with a medial, broad, longitudinal band; the abdomen with lateral, black stripe; the thorax suffused with grey.—Expanse 68-95mm., the males being the same size as females.

Larva.—The caterpillar is greatest in diameter about segments 4, 5 and the dorsum is somewhat flattened, the sides being in a plane at right angles to it: the transverse section being a trapeze though, of course, with the corners rounded, the ventrum-base being the shortest side; it decreases in diameter rather rapidly to anal segment which is narrow, smooth, rather long, ending in two straight, diverging, squarely separated, triangularly conical points; segments 2 to 4 are conspicuously flat on the dorsal portion. The head is greenish yellow in colour, round, more or less hidden under segment 2 in repose; the front margin of segment 2 straight. Segment 2 is about twice as broad at the front margin as the larva is at anal extremity. The ventrum is flattened. Segments 2-4 have each a short, lateral, conical, sharp, black spine, centrally situated and all of equal length. Spiracles are small, oval, finely bordered with black. Surface is dull, smooth. Colour of larva is grass-green with a subspiracular, yellowish line; top of segments down to the lateral region is greeny-whitish with a broad, dorsal, olive-green band, generally indistinct on segments 2-4; every segment except the last has two depressed brown lines across the greenish-white part parallel to the front and hinder margins, giving the appearance to each segment of having three folds; segment 4 has four such folds, the three anterior of which are black; there is a brown, interrupted, lateral line bordering the dorsal greenish-white area of all segments; ventrum light green. The osmeteria are shiny, glossy green in colour. Some larvæ have black instead of brown in the above description and in this case the dorsum instead of being greenish-white is black with or without two or three short, transverse lines laterally to each segment 6-11 forming a dorso lateral interrupted band on each side. Sometimes the colour may be dark, rusty brown instead of black and then the lateral band of short white marks is wanting. L: 32mm.; B: at segment 4-5, 9 mm.; H: at same place, 7 mm.

Pupa.—The pupa is square-fronted pointed behind, with two well separated

head processes and a short one on thorax, base of this latter process nearly perpendicularly over anterior end of pupa, ventrum flattened, dorsum transversely convex. Head with two short, thick, diverging, square-topped processes, slightly compressed dorsally and ventrally, ventral side being in the plane of the pupal ventrum. Segment 2 nearly perpendicular to longitudinal axis of pupa as to its dorsal line; the dorsal line of thorax parallel to that axis, the apex produced out over slope of segment 2 into a 1.5 mm. long, 1 mm. thick, flat-topped point at an angle of 105° with front slope of segment 2, the dorsal side of it in continuation with dorsal line of pupa to which it is inclined at 135° ; the inner margin of wing (lateral line of pupa) is raised on ridges, the ridge running up to and on to the thoracic process; there is no constriction about segment 5; the wings are expanded slightly in a rounded curve laterally at segments 5 and 6 where the pupa is consequently broader than anywhere else; the dorsal line from cremaster farward to apex of thorax is slightly convex, the ventral line is quite straight; cremaster is 4-sided, hollowed out ventrally in the middle somewhat, narrower at end than at base; the abdomen is somewhat 4-sided in transverse section, the ventrum and dorsum being flattened. Surface is rugose with exception of wings, dull. Spiracle of segment 2 indicated by circular depression or pit divided by the segment margin $2/3$ which crosses it as a ledge, the spiracle being situated at the bottom of the front half; other spiracles are oval with central, narrow, raised yellowish ovals, and are the colour of the pupa. Colour of the pupa is a very dark rosy brown with the ridges lighter. L: 26mm.; B: 9mm.; H: 8mm.

Habits.—The egg, of the usual shape and colour, slightly shiny, is laid singly on the upperside of a tender leaf where the young larva, emerging, lives in the usual way: lying along the midrib near the point on a bed of silk. It is dark in colour when it first emerges, has the usual forked spines and is distinguished by having a dorsal white region on abdomen. It is sluggish, walks with a halting gait and wanders very little except at the end when about to pupate. At that time it turns pinkish all over under the former colour and, descending to the ground, gets under a stone, a clod of earth, or under a dead leaf where it strings itself up by the tail and a short, tight body-band in a horizontal position more or less, its back downwards, and there undergoes the change into the pupa in semi-darkness. The butterfly has only one brood as a very general rule; the early caterpillars of April-June, of which there are always few, form pupæ some of which emerge in a fortnight or so; but the great majority of the chrysalides lie over for

ten months or more until the following year produces another crop of tender leaves. The foodplant is *Saccopetalum tomentosum*, Hooker, which loses most of its leaves during the hot weather and shoots profusely with the first rains when the butterfly is always most numerous. Dr. K. Jordan says that *Polyalthia longifolia*, Benth and Hooker, is eaten by the larva also. These two plants belong to the family *Anonaceæ* and the former is spread throughout India in the Plains and in the Hills. The insect is found in Sikkim; Central and Southern India; Ceylon. In Bombay the butterfly is found throughout Kanara, Belgaum, in parts of Dharwar, Bijapur and, doubtless, in many other localities in the plains, hills, forests and cultivated lands, and is very plentiful in certain places in the early monsoon months; it occurs from sea level upwards but nowhere, seemingly, at any great elevation; 2,000 feet to 3,000 feet seems to be about the limit. It flies fast but somewhat weakly, much closer to the ground than *P. antiphates* as a general rule, probably owing to the habit of the pupa. It is moderately fond of flowers, comes readily to damp patches of sand in the river and nalla-beds and to moist mud on roads in the hot pre-monsoon days in company with other butterflies and has the same ways of resting as *P. antiphates*.

P. aristeus, Cram., a very closely allied species nearly exactly similar, inhabits, with its subspecies, Sikkim, Assam, Burma, Tenasserim, Sumatra, the Malay Peninsula, Borneo, the Philippine Islands, many of the smaller islands of the Malay Archipelago, Aru, New Guinea and Queensland in Australia. *P. rhesus*, Boisd., is a very black species that inhabits Celebes.

93. *Papilio doson*, Lin.—This species was formerly known as *telephus*, Felder, also *doson* of the same author. It is now treated mostly as a subspecies of *P. eurypylus*, L., by lepidopterists.

Male and female *upperside*: black. Forewing: three slender, oblique, short, pale green streaks in basal half of cell and two irregular, small similarly coloured spots near its apex; a discal band composed of pale green spots that gradually diminish in size anteriorly, the spot in interspace 5 the smallest, the two in the interspaces above it slightly larger; a spot at base of interspace 7 and a sinuous, complete, subterminal series of similarly coloured ones. Hindwing: a transverse band that extends as far as interspace 2 posteriorly and is a continuation of discal band on forewing; the upper portion of this band white, the lower pale-green: this is followed

by a sinuous, subterminal series of small, pale-green spots as on the forewing. *Underside*: brownish-fulvous black; markings similar, larger, their edges slightly diffuse and all of a silvery white, slightly tinted with pale green. Hind wing, in addition, has a white, basal streak that extends halfway down the dorsal margin: another shorter, white subbasal streak from costa to the subcostal vein coalescent with the white of the discal band in the cell, the streak of ground-colour that lies between this subbasal band and the discal band jet-black, interrupted, where it crosses vein 8, by a crimson bar; finally, quadrate black spots near the apex of the cell and at bases of interspaces 1, 2, 3, all outwardly margined crimson. Antennæ, head, thorax and abdomen black; beneath the palpi, thorax and abdomen touched with white; the abdomen with dingy white, lateral line. The abdominal fold of the hind wing of the male is grey within with a fringe of white hairs.—Expanse 76-90 mm.

Larva.—The shape is similar to that of *P. nomius* though not so angular looking. The head is round, green, generally retracted under segment 2. Segment 2 is convex with a straight front margin with a small, black-tipped conical, horny spine or tubercle dorsolaterally on the margin; segment 3 increasing in width backwards, rather long, convex, ascending in dorsal line to segment 4 which forms the highest part of the body. Segment 5 is equally high and the region about the common margin of segment 4 and 5 is the broadest part of the body; the larva decreases in diameter thence backwards gradually, the transverse section always circular flattened ventrally; anal segment narrow, oblong, flattened dorsally, produced beyond claspers and ending narrowly in two diverging, not very long, more or less rigid points. Surface smooth, velvety, dull, head and ventrum downy, with a short, sharp, conical, shiny black conical spine laterally on segment 4. Spiracles oval, white, with a thin, black border. Colour bright grass-green, the lateral spine on segment 4 surrounded by a yellow 'eye,' with a subspiracular white band from segment 5 to anal end, the tail-points also white. The osmeteria are lemon-yellow in colour. The larva is sometimes black or very deep brown instead of green; always black in its early stages with the tail-points pure white; the egg-larva spined as usual; the segmental skin is always very dark green in colour. L: 38mm.; B: 10mm.; H.: 10mm.

Pupa.—Of the same type as that of *P. nomius*. Head prominently convex between the pear-shaped, bulging eyes; each eye with a short, conical anterior point, the front margin of pupa convex between them; segment 2 inclined to longitudinal axis of pupa at an angle of 45°, pentagonal more or less in shape, the longest side being the hinder margin, somewhat convex; thorax in the same plane of ascent as segment 2, perhaps slightly steeper, to the base of the long, thick, apical process which runs out from apex at right angles to front slope at an angle of 30° to longitudinal axis

of pupa, and having its dorsal edge in continuation with dorsal line of pupa; this process is straight, rounded at extremity, keeled on four sides dorsally, ventrally and laterally: these keels continued down dorsum of pupa as far as hinder margin of thorax, to meet the lines of wings continuing the tornal half of the terminal wing-margin on segment 5; and, anteriorly, on to the vertex of head; the broadest part of pupa is at segment 8; thence it decreases to anal end gradually, the cremaster being strong, continuous with body, 4-sided, with ventral, beaded extensor-ridges; wings slightly expanded at segment 7. Surface minutely indented; on thorax above wing margin, is a small tubercle or rising. Spiracle of segment 2 indicated by a narrow, oval, yellowish slit bordered in front by a coarse ledge; other spiracles are narrowly oval, yellowish, not large. Colour olive-green, margins of segments and keels whitish yellow as well as the two lateral lines on abdomen, one to each side. L: 30mm. along dorsal line to end of process; 29mm. along ventral line to front of head; B: 10mm. at segment 7; H: 10mm. at the same point; L of thoracic process: 4.5mm. by 1.5mm.

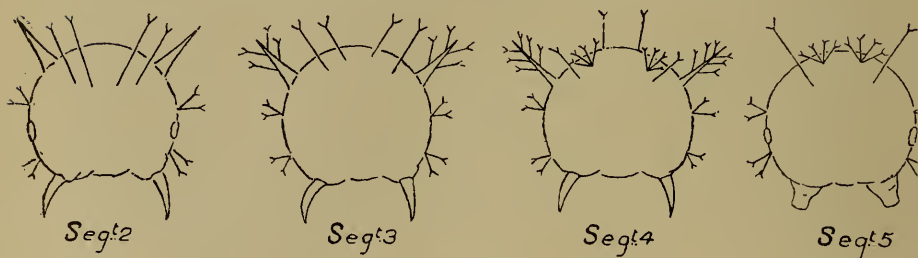
A diagrammatic representation of the spines of the egg-caterpillar is given below.

Habits.—The egg is laid in the same manner as that of *P. nomius* which it resembles in every way. The little larva has exactly the same habits and the grown caterpillar behaves in the same way exactly except when it comes to pupation. *P. doson* larva strings itself up to a twig, branch, underside of a leaf on its foodplant or some adjacent tree or shrub by the tail and a short body-string. The pupa does not as a rule lie dormant like that of *P. nomius* for any time but, when kept in captivity towards the cold weather, without a chance of dew or moisture of any sort, it will lie over for months like many others. The colour of the pupa varies of course with the colour of the surroundings it is formed in, also like most others. The butterfly is one of the most powerful fliers of the whole genus and is fond of sunshine and flowers though it merely sips at these in a perfunctory way, wasting no time at any one blossom; it always seems to be in a great hurry and can only be seen at rest when sipping the moisture on roads and in the beds of nallas in company with others of the genus and the stronger winged *Pieride*; even then it is easily disturbed and flies straight away as a very general rule. It is extremely plentiful in Kanara in the hot months and rains, may be found at any time of the year, but seems to be confined to the hills and jungles from the sea upwards; it

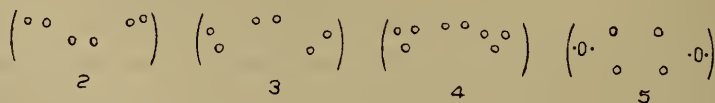
moves at all heights ; rest, when drinking, with the wings closed over the back and has a skipping flight very similar to the next two species. It is found in Ceylon and Southern India in the hills and jungles. The foodplant of the larva is the anonaceous *Saccopetalum tomentosum*, Hooker, and *Unona Lawii*, Hooker, upon which it has been found ; and doubtless other *Unonæ*.

There are many sub-species extending throughout India, Burma, into China, down through Tenasserim and the whole of the Malayan Region, to Australia ; also north to Japan. *Papilio evemon* Boisd. from Malacca, Sumatra, Java, Borneo is very like it ; also *P. procles*, Grose Smith, from North Borneo, and Kina Balu ; *P. bathycles*, Zink, from Java, Sumatra, Borneo, Assam, Burma ; *P. isander*, Godm. and Salv., from the Solomon Islands, &c., approaches *P. sarpedon*, L., forming the connecting link between it and *P. eurypylus* according to Rothschild.

Diagrammatic transverse sections of segments 2 to 5.



Papilio doson, 1st stage.



Papilio doson, dorsal plan.

94. *Papilio sarpedon*, Lin.—Male and female *upperside* : opaque black. Fore and the hind wings crossed from above the tornal area on the hind wing to near the apex on the forewing by a semi-hyaline, broad, pale-blue, medial band which is broadest in the middle, more or less greenish and

macular anteriorly; the portion of the band that crosses interspaces 6, 7, 8 on the hind wing white; beyond the band on the hind wing there is a subterminal line of blue, slender lunules. *Underside* similar, ground-colour dark brown. *Hindwing*: a short, comparatively broad, subbasal band from the costa to subcostal vein, and the postdiscal area between the median blue band and the subterminal lunules velvety black traversed by the pale veins and transversely, except in interspaces 6 and 7, by narrow, crimson lines; lastly, a crimson spot near the tornal angle with an admarginal yellowish-white spot beyond it. *Antennæ*, head, thorax and abdomen brown, the head and thorax suffused with greenish grey; beneath the palpi, thorax and abdomen touched with dingy white, the abdomen with two whitish lateral lines on each side. The male has the abdominal fold of hind wing grey within, furnished with a tuft of long, stiff, white hairs. Expanse 81-95mm.

Larva.—"The young larva is black or dark green, with numerous spines of which those on the metathorax are long and bristly; when full grown, green, beneath lighter, with a pair of short spines on each of the three thoracic segments and on the last segment; on the metathorax a yellow transverse band and from the metathorax to the anal segment a yellowish stripe above the legs; on *Machilus oederatissima*, *Geijera salicifolia*, *Litsea*, *Alseodaphne*, &c., and especially *Camphora officinalis*, where this tree has been imported. The yellowish egg is laid singly on the leaves and shoots of the food-plants." (*Dr. K. Jordan.*)

Pupa.—"Pupa green, the thoracic horn slenderer, more pointed and straighter than in the allied species, the lateral ridges extending downwards from the horn straight, between this carina and the frontal one a very slight, somewhat curved, vertical ridge."

De Nicéville gives a figure of the pupa in his paper "The Butterflies of Mussoorie," published at page 595 of Vol. XI of this Journal (the Journal of the Bombay Natural History Society), and says that the foodplant of the larva is *Machilus oederatissima*, Nees, Natural Order *Lawraceæ*. He also states that the pupation takes place in June and the imago emerges in the following spring presumably because the climate up there in Mussoorie is very cold during the winter; so that the butterflies behave like they do at home in England. *P. sarpedon* occurs throughout Continental India (except South India and Ceylon) to Java, the Philippines and Japan; and has a subspecies, *semifasciatus*, Honr., in China.

95. *Papilio teredon*, Felder (Pl. D 5, fig. 30 ♂, 30a ♀).—This is a slightly differentiated form of the above, distinguished in both sexes by the narrower medial band crossing both wings. The colour is brighter, the contrast between the green of the upper and the blue of the lower portion of the medial band more vivid. *Hindwing* more produced posteriorly at apex of vein 3 where it forms an elongate tooth or short tail. Expanse

74-90mm.; the males on the whole being about the same size as the females.

The last small spot of the wing-band just below the costa may be entirely wanting; indeed is generally wanting in the females from North Kanara.

Larva, 1st Stage. (*vide* figs. overleaf).—Shape: swollen in segments 3, 4, 5, thinning off to tail which is only half the width of segment 4. There is a large fleshy, supraspiracular tubercle on segments 3, 4, 14 which is dorsolateral on segment 2: the one on segment 2 being on front margin, that on segment 14 on hinder margin and the rest in centre of respective segments. These tubercles are long, conical, covered with little fine spines which are longly bifurcated at ends. There are four bifurcated shafts on front margin of segment 2; in a row between the dorsolaterals there is also a row of 4, similar shafts on segment 3 between the supraspiraculars: the same on segment 4: subdorsal and dorsolateral. On segments 4 to 12 there is a subdorsal, circular, ochreous tubercular spot set with 5 or 6 bifurcated shafts. On segments 5 to 12 there is a lateral tubercular spot with a single bifurcated shaft. On each segment 2 to 12 there is a supraspiracular tubercular spot with a short and a long bifurcated shaft and, under each spiracle, a similar spot also with two bifurcated shafts; and on the base of each proleg or in a corresponding region (where there is no proleg) a pair of similar bifurcated shafts. Segment 13 has the same arrangement of spots with shafts as the other segments. The spiracles are very small and black. The head is round, lightish brown-orange in colour, with a broad, dark band across from eyes to eyes; eyes are black; clypeus large, triangular; labrum, antennæ and jaws same colour as head, the last with tips dark. Colour of larva is green with the tubercles of segments 2, 3, 4 ochreous, those of segment 14 as well as that segment itself, white; a dorsal, sublateral and lateral brownish longitudinal band the whole length of larva; belly and prolegs white; true legs transparent white; all bifurcated shafts are black; the shafts of dorsolateral tubercles of segment 14 (tail points) are simple, not bifurcated. Segment 14 is flat and trapeze-shaped. L: 6mm.; B: 2mm. in broadest part without shafts.

2nd Stage.—The bifurcated shafts have all disappeared. The conical tubercles of segments 2 and 14 still exist but are now covered with simple, spinous hairs; the dorsolateral tubercles of segments 3 and 4 are very much shortened and similarly covered with hairs. The whole surface of the body is covered with fine, extremely minute, dark, pointed hairs. The head is round, orange, spotted darker, with the eyes brown. The colour of larva is dark olive-green, with the scars of the tubercular spots of 1st stage light; anal segment with tubercles thereof white; the subspiracular region whitish; a spiracular white line from segment 5 to segment 13; dorsolateral tubercles

of segment 2, 3 and 4 shiny black. Spiracles light brown surrounded by a black line. Shape same as 1st stage. L: 12mm.; B: 4.5mm.

3rd Stage.—Similar to the 2nd stage in every respect as to shape and spines and colour. The L: 15 mm.; B: 5.5mm.

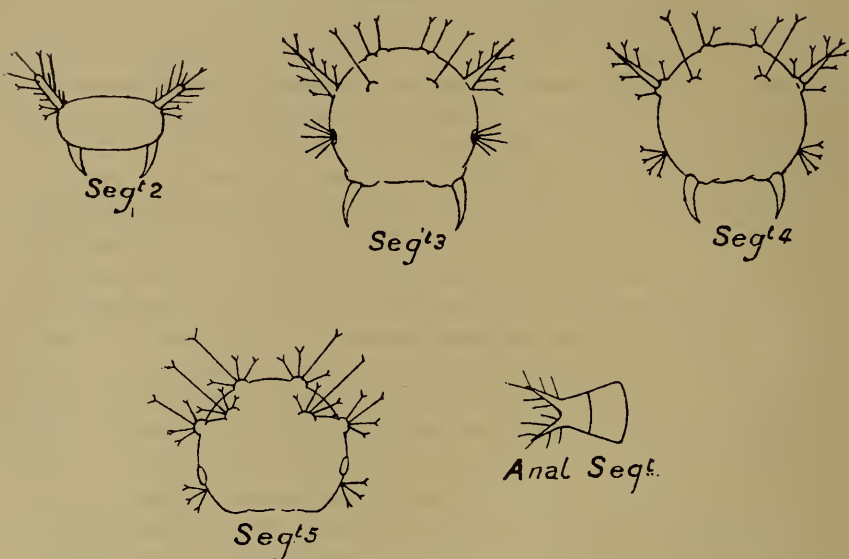
4th Stage.—Similar to the 3rd stage in every respect except that the hairs covering the body are now mere indications showing as black pin-points, being hardly raised. There is an indistinct, lateral, longitudinal, white line from segment 4 to segment 13; a subspiracular line or narrow band, yellow. L: 19mm; B: 7mm.

5th Stage. (Pl. C. fig. 16).—The shape is the same as in the 4th stage except that the dorsolateral tubercles of segment 4 are triangular, flattened before and behind, shiny black at base and white on side, surrounded at base by a black line, the two tubercles connected across the segment by a distinct yellow ridge; the dorsolateral tubercles of segments 2 and 3 are similar in shape but considerably smaller: they are shiny and have a few minute hairs on them. The anal points are as in 4th stage. The head is green with a yellowish tinge with black eyes; covered with fine hairs which are light in colour. The body is likewise covered with extremely minute, light hairs. The colour is a fine rich green with segments 13 and 14, spiracular region, legs and prolegs greenish-white; there is a fine yellow lateral line and subspiracular yellow band from segment 6 to segment 13; the dorsolateral tubercles of segment 2 and 3 are white and black. L: 28mm.; B: 10 mm.; when stretched; L: 34mm.

Pupa. (Pl. 1, fig. 13a)—Is very like that of *P. doson* in shape, except that here the thoracic process is at an angle of 45° to the longitudinal axis of pupa instead of 30° . Eyes prominent, with each a short point anteriorly, these points separated from the very slight dorsal ridge of head by a small sinus on each side of it; a ridge runs from the point of thoracic process down it on each side laterally, and in a curved line to the dorsal margin of wing along which it runs to about the middle of segment 8, being slightly thickened about the centre of the wing-margin; another ridge runs down the front of process and one posteriorly, the former continued down the dorsal line of head, the latter down the dorsal line of segments 4, 5 dividing into two diverging to become subdorsal, then lateral, gradually in an even curve, these two being widest apart about middle of abdomen whence they again converge to meet at base of cremaster; there is also a slight spiracular ridge from cremaster forward to thoracic process; but none of these carinations are pronounced; the shoulders are only slightly prominent and have each a short, low ledge at an angle to the plane joining spiracular lines; the cremaster is stout, square in transverse section, truncated at end and carinated down each of the four sides lengthways, continuations of the body carinæ. Surface minutely and shallowly rugose. Spiracles of segment 2 not any way peculiar; others longly oval, small

colour of body. Colour rather light green, all the ridges light yellow. L: 31mm.; B: 10.5mm.; H: 8mm.; L: of thoracic process: 9mm.

Diagrammatic transverse sections of segments 2 to 5.



Papilio tereon, 1st stage.

Habits.—These are very much the same as for *P. doson*. The egg is deposited singly on the top of a leaf, generally a tough one, in a shady place in the jungles. It is of the usual type. The little larva eats the egg shell and makes a seat in the centre of the leaf, generally at the base, spinning copious white silk for the purpose. The full grown larva is very sluggish, walks slowly and haltingly and does not wander far to pupate. The change takes place generally on the underside of a leaf where the larva suspends itself with a strong tail-pad and a close body-string. The butterfly is probably the strongest and swiftest flying of the whole genus; it is generally seen sprinting along jungle paths or hurrying over low shrubs and up into the air over the foliage of the highest trees, keeping more to the open, in the sense that it does not dive amongst the undergrowth and into thick places, than any of the other swallowtails. It frequents flowers in much the same intermittent, restless way as the last species and forms one of the lot that visit damp sand and wet mud in the hot weather. It rests

with the wings closed and may be found at any time of the year in the hilly forest regions of the Western Ghats in Bombay. It is a jungle species inhabiting the country at all levels from the sea up. The food-plants of the larva are belonging to the *Laurineæ* and it has been bred on *Cinnamomum zeylanicum*, Breyne, *Alseodaphne semicarpifolia*, Nees, *Litsea chinensis*, Lam., *Machilus macrantha*, Nees. Many of these are great big trees but the butterfly generally chooses small saplings or low shoots to lay on. *P. teredon* is confined to Southern India and Ceylon and is said to be found nowhere else.

Other *Subspecies* are *parsedon*, Westw., from Timor and other Malayan Islands, with a longer tail than *teredon*; *choredon*, Feld., from Australia and New Guinea with a broader band; *anthedon* Feld., from Amboina, Ceram, with large, strongly arched submarginal spots to hind wing; *nilon*, Feld., from Celebes, &c., with all the spots of the band separated. *P. cloanthus*, Westw., from North India, Assam, Shan States and China has a fine subspecies *sumatranus*, Hagen, with a very broad, yellowish green band, occurring in Sumatra.

Habits.—The eggs are laid singly on young shoots, generally of small young trees or saplings, in shady places, and generally on the upper surface of leaves. The larva always lies on the upper surface in the centre of a leaf; when alarmed, it throws out a stiff, jelly-like process with a short base and two long diverging, cylindrico-conical branches of a light, translucent lemon-yellow colour from the membrane between the vertex of the head and segment 2; this process contracts into itself slowly when withdrawn; it smells strongly of the leaves of the food-plant when crushed—this organ is the osmeterium.

The coloured figure of male and female (figs. 30, 30a) on plate D5 show the upperside not black enough, the blue band perhaps too green, certainly not bright enough; there is too much red shade about it as usual. The same may be said of the undersides. The difference in length of the tail to hind wing in the two sexes is too much accentuated.

96. *Papilio agamemnon*, L. (Pl. D5, fig. 29).—Male *upperside*: black. Fore-wing with the following green markings: a spot at the extreme base of the costal margin, a transverse, short bar near base of cell and seven spots in

the cell beyond, two and two, except the apical spot which is single; two spots beyond cell-apex; a spot at base of interspace 1a and 1 followed by two, short, oblique, macular bands; a discal series of spots, decreasing in size towards the costa and a postdiscal series of smaller spots that begins with two in interspace 1; the spots in interspace 7 in both series are out of the line, placed outwards. Hindwing: three series of similarly coloured markings that run transversely across the wing more or less parallel to the dorsal margin, the upper markings, (these in interspace 7, that is) white; a short, greenish stripe at the extreme base of the wing. *Underside*: fuliginous brown or brownish black, more or less suffused with pink along the costal margin, on apical area and along the outer margin of the discal markings on the forewing, broadly along the dorsal and terminal margins and at base of interspaces 6 and 7 on the hind wing; markings similar to those on the upperside but less clearly defined and somewhat more grey in tint. Hindwing black, inwardly red-margined spots superposed on the pink area in interspaces 6 and 7. Cilia very narrow, pale pink. Antennæ, head, thorax and abdomen black; thorax above and the abdomen on the sides streaked with greenish grey; beneath ochreous grey, touched on the thorax with pink. Female similar, but with a streak of greenish white along the dorsal margin on both under and upper sides.—Expanse 90-102mm.

The ground-colour of the underside is somewhat variable; this, in some specimens, is much paler than in others and varies also in the amount of tint of pink suffusion. Burmese specimens generally have indications of a more or less complete series of red spots on the underside of the hindwing in continuation of the red spots at base of interspaces 6 and 7: in this they approximate to the Andaman and Nicobar race.

Larva.—Like that of *P. doson*. Head of the usual shape, large, green. The body is the same shape as that of *doson*: is swollen about segments 4, 5, decreasing perfectly regularly to the end, the sides of the body more or less perpendicular from the flattened ventrum; the thickest part is at segment 4; the anal segment is narrowed, more or less square at extremity, ending in two simple, curved, divergent spines which are separated at their bases by an interval equal to their own length; segment 2 has a dorsolateral simple, thin, pointed metallic blue-black spine on front-margin which is 1.5 mm. in length; the two directed out in front and diverging one from the other; segment 3 has two similar, smaller, curved spines, one on each side, laterally and centrally; on segment 4 are two longer, similarly situated spines of 2 mm. in length (one to each side), from an orange spot. These spines are brittle and break off easily from the base. Surface of body smooth, dull, the segments well marked, though the margins are in no way constricted. Spiracles rather small, oval, black. Colour of body dull grass-green, obscurely blotched darker; a

double white subspiracular line from segment 5 to anal end. The osmeteria are light yellow in colour. L: 38mm.; B: 10mm.

Pupa.—Like those of *P. doson* and *P. teredon*.—Head very slightly convex across frons with two small, short, though prominent cones, one on each eye; segment 2 and head form together, seen from above, a square, slanting up from front of pupa at an angle of 75° with longitudinal axis of pupa to base of thoracic process; thorax little broader than segment 2, its front slope to base of process at an angle of 75° to the pupal length-axis; the process 2.75mm. long, stout (1mm. by 2mm.) laterally compressed, rounded at extremity projecting out in front, perpendicular to the front slope of thorax, continued dorsally backwards in a straight line with dorsum of abdomen, there being no constriction; the wings are expanded laterally into a narrow ledge; the abdomen is more or less square in transverse section and diminishes gradually in diameter to cremaster; the cremaster also square in section; surface of pupa finely rugose under the lens all over. Spiracles of segment 2 narrow brown slits; others rather round, moderately large, with a central oval inside which is a raised central slit, colour of the body. Colour grass-green with a row of darker green, sub-dorsal spots on abdomen; dorsal margins of wings lined with brown-red and slightly raised, the ridge thus formed running up to thoracic process, starting from front margin of segment 8; this red-brown marking is interrupted by an included small, white spot on the common margin of segments 6 and 7 and includes another white, triangular spot at front margin of segment 5 and another at the margin of segment 4: the apex of this latter spot is connected by a line with a prominent, horse-shoe shape ridge on the shoulder; edges of cremaster, four of them, white, the two upper ones being produced along sides of abdomen forwards to meet dorsally at anterior margin of segment 4; the other two white edges stop at segment 10. L: 29mm.; B: 9mm.

Habits.—The oviposition, the shape, colour of egg are the same as for *P. doson*. When young the larva lives on the centre of the upperside of a leaf; when full grown hides in a similar position among the innermost leaves of the plant. It is subject to parasitic attack. The pupation takes place on the underside of a leaf, against a stalk or on a twig, the tail-fixing being strong, the body-loop fairly short. The butterfly is a fast, strong flier and is very fond of flowers; it has a skipping flight and keeps much to certain beats over bushes and low vegetation where it flies backwards and forwards in the hot sun. It is found in all sorts of country except the very dry regions and is fairly plentiful everywhere in India, both in the jungles and in the open, in the hills and in the

plains. It does not go to water like the last few species; at least it is rarely met with amongst the drinking crowds in the nallas and on roads in the hot weather, though it may always be found at flowers all the year round in the Bombay Presidency; it flies earlier and remains later on the wing than any of the others. Like them, it is restless and is not easy to capture except at flowers. The foodplants of the larva are all anonaceous. It has been bred on *Saccopetalum tomentosum*, Hooker; *Anona squamosa*, L.; *A. reticulata*, L.; *Polyalthia longifolia*, Benth. and Hooker; *Unona discolor*, Vahl.; and doubtless feeds upon most *Anonaceae*. *Anona* is the Custard Apple or *Sitaphal* of India. The distribution of *P. agamemnon* is more or less throughout India, Burma, extending to China and through the Malayan Region to the Philippines, and north to Japan. The subspecies *ligatus*, Rothsch., goes into Australia; *decoratus*, Rothsch., inhabits the Nicobars and Andamans; *salomonis* of the same author extends to the Solomon Islands.

In the coloured figure (fig. 29, Pl. 5), the whole thing is again too red in shade, the upperside is not black enough, the colouring of the underside not delicate enough.

(To be continued.)

SOME NEW INDIAN MAMMALS.

BY

R. C. WROUGHTON.

In a paper on the species of the Genus *Rhinopoma* (Ann. Mag. N. H., Vol. XI, p. 496, 1903), Mr. Thomas pointed out that Dobson had lumped two separate species of Egyptian *Rhinopoma*, differing markedly in size, under the name *microphyllum*, Brünnich. Blanford followed Dobson, and accepted the name *microphyllum* for the Indian form. He notes that the forearm measures 2.6 inches but adds "but many specimens are considerably smaller with a forearm of 2.1" or less."

Among the specimens of *Rhinopoma* in the Cutch collection, of our SOCIETY'S MAMMAL SURVEY, from Bhuj, are representatives of two undoubtedly distinct species, with forearms about 60 and 70 mm. respectively. Either, therefore, we may hope to obtain a third species of the Genus, or Blanford was referring to the Arabian form, since named *muscatellum* by Mr. Thomas (l. c. supra), for there is no known *Rhinopoma* with such a short forearm as 2.1" = 52.5 mm. in India.

The smaller specimens are undoubtedly *hardwickii*, while the larger, though resembling *sumatree*, Thomas, in size, are separable as a distinct species, which I propose to call:—

RHINOPOMA KINNEARI, * sp. nov.

A large *Rhinopoma*, about the size of *R. sumatree* with broader ears and broader, stouter skull.

Fur short, 3-4 mm. on the back. General colour above brownish-drab, warmer in colour than the drab-grey of *hardwickii*; below paler. Face in front of ears, ears, and lower back, naked; in *sumatree* the fur of the back is continued almost to the root of the tail. Ears broad, 15 mm. (12 mm. in *sumatree*.)

Skull.—Broad and stout, strongly crested, inter-orbital ridges well marked, a marked transverse ridge on each side, immediately above the nostril, sides of mesoptergoid fossa sub-parallel,

* Named in honour of the Society's hard working Curator, Mr. N. B. Kinnear.

anterior end of fossa rounded, extending to level of front of posterior molar (in *sumatræ* the fossa is markedly broad posteriorly, its margins converging sharply anteriorly, the anterior apex not reaching the last molar). Anterior nasal opening markedly larger than in *sumatræ*.

Dimensions of the Type (recorded by the Collector).—Head and body 80; tail 63; forearm 70; ear 21.

Skull.—Greatest length 22·5 (19, 21·2); basal length, 19·5, (15·5, 18·2); zygomatic breadth, 13·5 (11·3, 12·8); breadth of brain case, 9·5 (9, 9·2). Front of canine to back of m³, 8 (6, 5·8).

(NOTE.—The dimensions in brackets are those of the type skulls of *hardwickii* and *sumatræ* respectively.)

Habitat.—Bhuj, Cutch.

Type.—Adult male. B. M. No. 11·12·11·1. Original No. 458. Collected 28th August 1911, by Mr. C. A. Crump and presented by the Bombay Natural History Society to the National Collection.

The following is a key to the known species of *Rhinopoma*.

KEY.

A.—Tail shorter than forearm, skull with a transverse ridge, on each side, immediately above the nostril.

a. Size larger, forearm 70-73 mm.

a¹. Ears narrower, 12 mm.; fur of back extending almost to the root of the tail (Sumatra) *sumatræ*, Thos.

b¹. Ears broader, 15 mm.; lower back naked (Cutch) *kinneari*, sp. nov.

B. Size smaller, forearm 65-67 mm.

(Egypt) *microphyllum*,
Brünnich.
= *lepsianum*, Peters.
= *cordofanicum*,
Heuglin.

B.—Tail longer than forearm; skull with a globular swelling on each side above the nostril.

- a. Size larger, forearm 57-61 mm. (India). *hardwickii*, Gray.
 b. Size medium, forearm 52-55 mm.
 (Egypt)... .. *cystops*, Thos.
 c. Size larger, forearm 49-50 mm.
 (Arabia) *muscatellum*, Thos.

When comparing some *Pipistrelles* collected by Mr. Crump with the series in the National Collection, I found some specimens in the latter which are easily separable from *Pipistrellus minimus*, of which they are the northern representatives. I propose to give them the name:—

PIPISTRELLUS MIMUS GLAUCILLUS, subsp. n.

The northern dwarf Pipistrelle.

A pipistrelle scarcely differing from *minimus* except in size and colour.

Size rather larger than *minimus*, but tail slightly shorter. Fur as in *minimus*. General colour above 'mouse grey' (near 'bistre' in *minimus*), individual hairs grey, with whitish tips; below, as in *minimus*, the hairs are brownish black with long whitish tips; giving a silvery effect on the belly. The ears on the average longer and the tail shorter than in *minimus*.

Skull with the braincase rather shallower, otherwise quite as in *minimus*.

Dimensions.—Head and body 48; tail 28; forearm 29; ear 12.

Habitat.—Multan, Punjab.

Type.—Adult male. B. M. No. 10.1.18.15. Original number 328. Taken on 18th July 1909 by Major H. N. Dunn. R.A.M.C., and presented to the National Collection.

Major Dunn took four specimens at Multan and one at Umbala. They are very even in colouration, and, when mixed in a long series of true *minimus*, may be picked out at a glance. They are no doubt the northern representatives of *minimus*.

I received lately for identification, from the Society, a specimen of a Leggada from Lahore, presenting certain skull characters which seemed to show that it held, to some extent, the position

with regard to *Leggada* which *Pyromys* (Vol. XX, p. 996) does to *Epimys*. A closer examination of the series of *Leggada* obtained by Mr. Crump in Cutch, showed that these too (which are undoubtedly *L. sadhu*) had the same formation of the skull and could not therefore be a local race of *platythrix*. Amongst these undoubted specimens of *L. sadhu*, however, are some which, while showing the same mammary formula, are smaller in size and have the peculiar skull formation of *sadhu* less well developed.

I propose to describe them as :—

LEGGADA CINDERELLA, sp. nov.

The Cutch Spiny Mouse.

A *Leggada* of the *sadhu* type with a mammary formula of 4-2=12, but of smaller size, and having the mesopterygoid fossa narrowed anteriorly but the posterior nares not, or scarcely, closed over.

Size slightly smaller than in *sadhu*. General colouring differing but little from that of that species, viz., drab grey above and pure white below.

Skull markedly smaller, with the mesopterygoid fossa narrowed anteriorly but the posterior nares not, or scarcely, roofed in.

Dimensions of the type (recorded by the Collector).—Head and body 85; tail broken, but judging from proportions in other specimens about 67; hind foot 16; ear 13.

Skull.—Condylar-basal length 22 (25); basilar length 19 (21); zygomatic breadth 6 (7.5); nasals 9.5 (10); diastema 6 (7.5); upper molar series 4 (4.5).

Habitat.—Cutch State. (Type from Bhuj.)

Type.—Old female. B. M. No. 12.1.9.12. Original No. 321. Collected, 27th July 1911, by Mr. C. A. Crump and presented to the National Collection by the Bombay Natural History Society.

Mr. Crump obtained 8 or 9 specimens, some of them at the same places in which he took *L. sadhu*.

The peculiar formation of the mesopterygoid region in the skulls of *sadhu* and *cinderella*, though it has not been recorded in an Indian *Leggada*, is well known in some African forms, where it varies in definition in various species.

The Cutch Porcupine proves on examination to differ from the Dekhan form. I propose to call it :—

HYSTRIX CUNEICEPS, sp. nov.

The Rajputana Porcupine.

A porcupine of somewhat smaller size than *leucura*.

Externally differing but little from *leucura* except in size, and a somewhat paler colouring, especially about the head and neck.

Compared with *leucura*, the skull is markedly smaller and narrower and its greatest breadth is across the squamosal, instead of across the maxillary roots of the zygoma, as in the former. Bullæ noticeably smaller.

Dimensions of the type.—Head and body 680; tail 88; hind foot 86; ear 42.

Skull.—Condyllo-basal length 145 (155); basilar length 131 (139); zygomatic breadth, at the level of the back of the nasals 72 (85); the same at the level of the back of the parietal 78 (80); length of nasals on median line 71 (80); anterior breadth of nasals 33 (35); posterior breadth of nasals 34 (46); braincase breadth 51 (61); diastema 42 (49); postero-anterior length of bullæ 18 (20); molar series 34 (32).

Habitat.—Cutch and Rajputana. (Type from Nokania, Cutch.)

Type.—Adult male. B. M. No. 12.1.9.11. Original number 261. Collected on July 14, 1911, by Mr. C. A. Crump and presented to the National Collection by the Bombay Natural History Society.

The skull dimensions given in brackets above are those of an adult male of *leucura* from Khandesh, which, I am satisfied, by comparison with Sykes' type, is true *leucura*.

There is, in the National Collection, a specimen from Rajputana which, except that it is younger, appears to agree in all characters with the present form, and I have therefore proposed the name "Rajputana Porcupine."

In a collection from the Nimar District, made by Mr. C. A. Crump, under the auspices of our Mammal Survey Fund, is a

single specimen of a mouse, which is so different from anything recorded, that I propose to describe it under the name of

MUS PHILLIPSI.

Phillips' Spined Mouse.

A small mouse, slightly larger than *Leggada booduga*. Coat composed almost entirely of coarse spines, coarser even than in *Leggada platythrix*, overlying an underfur of shorter colourless hairs.

General colour.—Above, 'drab,' tinged with blackish brown on the back, individual spines of the back pale silvery grey, with rather long (2-3 mm.) dark brown tips; below, pure white, hands and feet white, tail coloured like the back, slightly paler below, well clothed with stout, bristly hairs, which are long for the size of the animal. Footpads 6 as in *Mus*, the granulations of the sole, so characteristic of *Acomys*, entirely absent.

Skull markedly larger than in *Leggada booduga*, about as in the common Indian House-Mouse. The frontal ridges strongly marked, as in *Leggada platythrix*, but diverging more abruptly, in passing backwards from the interorbital region than in that species, so that, seen from above, the parieto-frontal area seems almost 'pyriform,' instead of evenly broadening backwards as in *L. platythrix*, and still more in *Mus 'manei'*. The dentition is quite that of true *Mus*, the anterior molar being longer than the other two together, and at the same time lacking the forward prolongation of the anterior molar, with its crowning cusp, which characterizes *Leggada*. The palatal foramina reach backwards barely beyond a line joining the anterior edges of the first molars, while in *Mus manei* they extend backwards at least to one-third of the length of the first molar, and in *L. platythrix* to nearly two-thirds.

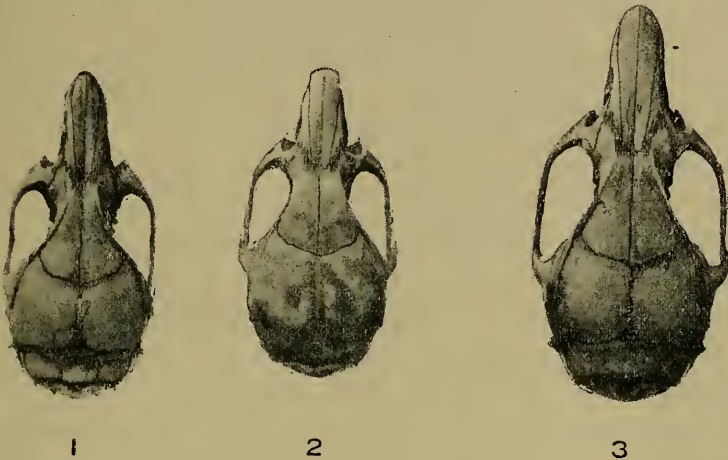
Dimensions of the type measured by the Collector.—Head and body, 79; tail, 60; hind foot, 14. (The ears of the specimen have unfortunately been eaten off by ants.)

Skull.—Condylbasal length, 21·5; basilar length, 18; greatest breadth, 11; nasals, 9; diastema, 6·5; upper molar series, 3·7.

Habitat.—Nimar District, C. P. (Type from Asingarh. Altitude 1,500.)

Type.—Old male, B. M. No. 12, 3, 2, 1 (Original Number 618). Collected 26th October 1911, by Mr. C. A. Crump, and presented to the National Collection by the Bombay Natural History Society.

This interesting little jungle mouse is separable at once from any form of *Mus* or *Leggada*, recorded from India, by its coat, composed entirely of coarse spines, giving it a strong superficial resemblance to *Acomys*, to which however, as shown by its skull and dentition, it is in no way related. It would be most interesting to know the mammary formula of this species, *i.e.*, whether it has 10 mammae, like *Mus* or 12 like *L. platythrix*.



No. 1.—*Mus phillipsi*.

No. 2.—*Mus manei*.

No. 3.—*Leggada platythrix*.

The above figures show the skull differences in the three species, the absence of the frontal ridges differentiating *Mus manei* from the other two, and the size and shape of braincase separating *M. phillipsi* from *L. platythrix*.

I have much pleasure in naming this well-marked new species after Mr. R. M. Phillips, D. S. P., Dharwar, who has given such whole-hearted assistance to our Collector.

TERMITES FROM BRITISH INDIA (BOMBAY)
COLLECTED BY DR. J. ASSMUTH, S.J.

BY

NILS HOLMGREN (STOCKHOLM).

(*With Plates A, B, C and D.*)

After WASMANN in 1903 published his paper on "Termiten, Termitophilen und Myrmecophilen gesammelt auf Ceylon von Dr. W. Horn, 1899, etc.," the termite fauna of India seems to have been lost sight of by termitologists. WASMANN's Treatise on the Termites of the Continent of India (contained in the above named paper) is based on extensive material collected by his correspondents in India, Heim, Assmuth, Redemann, Martin, Hoogwerf, and others. As will always happen in such cases, our knowledge of the different species of termites remained incomplete, and it has not yet been possible to fill up the gaps.

As regards the termite fauna of Ceylon, which was dealt with by WASMANN in the paper just mentioned, the collections of Escherich and Green, which I have worked up, have completed our knowledge of it in several points, and the number of species has thereby been increased considerably; however here, too, several gaps remain to be filled up by future research.

As for the termites of the Indian Continent our knowledge of them has been enlarged somewhat by DESNEUX's description of some termites of Sind.

The latest valuable contribution to this subject comes from Dr. Assmuth, who, I am glad to see, has again begun collecting in the neighbourhood of Bombay and who sent me last year a rich collection (57 tubes) of Bombay termites. There is, it is true, but one new species in the collection, which however is most valuable as completing in a large measure our knowledge of the Indian termites, both as regards the different castes and their several habits.

The following species in British India had been known already:—

Fam. PROTERMITIDÆ, Holmgr.

Hodotermes macrocephalus, Desn.; all castes.

Fam. MESOTERMITIDÆ, Holmgr.

Leucotermes indicola, Wasm.; smaller soldier, worker.

Coptotermes Heimi, Wasm.; imago.

Fam. METATERMITIDÆ, Holmgr.

Termes Estheræ, Desn.; all castes.

Odontotermes obesus, Ramb.; all castes.

„ *obesus*, subsp. *wallonensis*, Wasm.; all castes.

„ *brunneus*, Hag.; imago.

„ *Horni*, Wasm.; soldier.

Microtermes incertus (?), Hag.; soldier and worker.

„ *sindensis*, Desn.; imago.

„ *mycophagus*, Desn.; all castes.

Microcerotermes Heimi, Wasm.; all castes.

Hamitermes quadriceps, Wasm.; soldier and worker.

„ *Belli*, Desn.; all castes.

Eurytermes Assmuthi, Wasm.; all castes.

Capritermes incola, Wasm.; all castes.

Eutermes bififormis, Wasm.; all castes.

„ *Heimi*, Wasm.; all castes.

„ *rubidus*, Hag.; all castes.

Anoplotermes (Speculitermes) cyclops, Wasm.; imago and worker (i.e., all castes).

Our information about three of them has been enlarged by Assmuth's latest collection which contains the following :—

Leucotermes indicola, Wasm.; imago and larger soldier.

Coptotermes Heimi, Wasm.; soldier and worker.

Odontotermes brunneus, Hag.; soldier and worker.

New for the Indian continent is :—

Odontotermes Feae, Wasm.; soldier, larger and smaller worker (the latter of which is at the same time new to science).

The following is a new species :—

Microtermes obesi, n. sp.; imago.

It is a striking fact that the collection contains no *Protermitidae* whatever.

Though the number of new forms thus discovered is not large, still Assmuth's collection is all the more valuable, as he has

added to each number more or less detailed notes on the habitats, etc., which are without doubt among the best I have received from my correspondents. The notes are so instructive and have been made so carefully as to enable me to publish them here with hardly any change. Assmuth is likewise responsible for the photographs 1-7 which are reproduced with this article.¹

Fam. **MESOTERMITIDÆ**, Holmgr.
 Subfam. **LEUCOTERMITINÆ**, Holmgr.
 Gen. **LEUCOTERMES**, Silv.

Leucotermes indicola, Wasm., 1903.

IMAGO.—Almost identical with that of *Leucotermes ceylonicus*, Holmgr. Antennæ, however, of 16-17 segments (in *L. ceylonicus* of 15 segments). Ocelli generally absent (in *ceylonicus* they are punctiform). Length with wings 9 mm. (in *ceylonicus* 10 mm.).

LARGER SOLDIER.—Very nearly the same as that of *L. ceylonicus*, but antennæ of 15 segments (in *ceylonicus* of 14).

SMALLER SOLDIER AND WORKER.—See WASMANN, 1903. Cf. also HOLMGREN : Ceylon-Termiten, in : ESCHERICH. Termitenleben auf Ceylon, 1911.

Collector's Report:—

BOMBAY, 15-6-1911.—“From the chemical laboratory of St. Xavier's College, room on ground floor; the termites seem to have come out from underground and had almost completely eaten up several boxes of dealwood of which they are specially fond.” (Assmuth.)

KHANDALA, 6-6-1911.—“Caught by lamplight in room. Seem to be rather rare in this place and not to occur in larger swarms as is otherwise the case with these termites, since I saw only two or three specimens.” (Assmuth.)

Note.—From the above remarks it appears that *L. ceylonicus* and *L. indicola* are very closely allied to, yet different from, each other. The differences are, however, so small as to allow the two

¹ Assmuth begs on this occasion to give expression to his deep sense of gratitude to the authorities of St. Xavier's College without whose generous aid the many excursions necessary for collecting the material would have been impossible, and also to Mr. J. P. Mallan, M.A., Assistant Professor of Biology at St. Xavier's College whose able help is responsible for much of the success achieved.

kinds to be characterised as distinct races only. I have nevertheless kept them separate, because the interest which attaches to them is precisely based on the slight diversity, not on the similarity of their structure. Both species are in all probability so-called geographical forms of *Leucotermes tenuior*, Hav., from Sarawak.

Subfam. **COPTOTERMITINÆ**, Holmgr.

Gen. **COPTOTERMES**, Silv.

Coptotermes Heimi, Wasm.

IMAGO.—With regard to the tables printed in Zool. Anz. Vol. XXXVII, p. 552, I wish to remark that the measurements of *Coptotermes Heimi* are somewhat larger than stated there and, consequently, nearer to those of *Coptotermes ceylonicus*—

	<i>C. traviens</i> , Hav.	<i>C. Heimi</i> , Wasm.	<i>C. ceylonicus</i> , Holmgr.
Breadth of head ..	about 1·2 mm.	1·3-1·4 mm.	1·4-1·5 mm.
" " pronotum ..	" 1·05 "	1·2-1·3 "	1·3-1·4 "
Length ..	" 6 "	7 "	8 "

SOLDIER.—Scarcely different from *Coptotermes traviens*, Hav., *ceylonicus*, Holmgr. and *formosanus*, Shir. In *Coptotermes traviens* the antennæ are of 14 segments, in the other species of 15.

Measurements.¹

	<i>C. traviens</i> , 4 specimens.	<i>C. ceylonicus</i> , 5 specimens.	<i>C. Heimi</i> , 10 specimens.	<i>C. formosanus</i> , 10 specimens.
Length of head (without mandibles) ..	1·25-1·36	1·11-1·29	1·29-1·44	1·41-1·48
Breadth of head ..	1·1-1·6	1·03-1·17	1·1-1·5	1·04-1·22
Breadth of pronotum ..	·73-·78	·66-·9	·74-·81	·78-·85

¹ The tables on p. 193 in "Termitenleben auf Ceylon" are incorrectly printed—see the tables given above.

WORKER.—Same as in *travians*.

Collector's report :—

BOMBAY, 15-3-1911.—Imagines. "Caught by lamplight in room." (Assmuth.)

25-4-1911.—"Termites on footpath behind St. Xavier's College. Had probably been thrown on the road from one of the neighbouring houses or gardens. . . ." (Assmuth.)

20-8-1911—"From St. Mary's College, Bombay (Mazagon) found in room in wooden shelves partly eaten up by termites, and in garden in front of room in stump of tree. Unfortunately specimens from both places mixed up together in same tube by the Collector, Rev. Schurhammer; but possibly both parties belong to the same species." (Assmuth.)—Both are, in fact, of the same species.

Fam. **METATERMITIDÆ**, Holmgr.

TERMES SECTION.

Gen. **ODONTOTERMES**, Holmgr.

Media of forewing arising from Cubitus. Third segment of antennæ shorter than second.

Odontotermes obesus, Ramb.

Specimens from numerous colonies and nests are at hand. As stated previously by WASMANN, the species varies rather considerably in size, and also a little in appearance. At first I was inclined to assign the specimens sent to me to two different species; but a closer examination of the material seems to show that the various forms are nothing but different biological types of the same species; for I have been able to insert between the two abovementioned forms an intermediary one containing qualities of both. I propose to name these three forms *Odontotermes obesus* *a*, *b* and *c*.

Odontotermes obesus a:—Length of head of soldier 1·85-2 mm., breadth of head about 1 mm., length of body about 3·7 mm. Labrum reaching to one-half the length of mandibles. Salivary glands not very well developed.

Odontotermes obesus b:—Length of head (soldier) 1·96-2·03 mm., breadth of head 1·11 mm. approximately, length of body 4·25-4·5



I.—TYPICAL NEST OF *Odontotermes obesus* RAMB. form *a* (Holmgr.).



II.—FUNGUS-BEDS OF THE SAME.

TERMITES FROM BRITISH INDIA.

mm. Labrum reaching to either one-half, or one-third only, the length of mandibles. Salivary glands same as in *a*.

Odontotermes obesus c.—Length of head (soldier) 2·2·33 mm., breadth of head about 1·33 mm., length of body 5·25-5·4 mm. Labrum reaching to one-third only the length of mandibles. Salivary glands very strongly developed. (Different from *Odontotermes obesus wallonensis*, Wasm.)

Collector's report:—

Odontotermes obesus a.

KHANDALA, 21-1-1911.—“In dry half-burnt twigs and other vegetable remains, which, after being covered with friable galleries of red soil, had—as far as thus covered—been eaten up by termites. Soil used for building galleries evidently not so well cemented with secretions from salivary glands as is otherwise done by *Termes obesus*.” (Assmuth.)

21-1-1911.—“Pretty tall mound at foot of bush on low slope.” (Assmuth.)

26-2-1911.—“Smaller mound crowned by turrets, constructed on hillside in midst of shrubs.” (Assmuth.)

26-2-1911.—“Middle-sized mound at foot of high tree.” (Assmuth.)

26-4-1911.—“Hillock nearly 6 feet high leaning against a tree. Two queens, but only one king taken in nest.” (Assmuth.)—Imagines of *Microtermes obesi*, n. sp., found in same nest.

22-5-1911.—“Mound built on slope by side of mountain path. Nest deserted, probably pillaged by ants. Fungi grown to long thick white stalks of 10 mm. and more in length. No termites in fungus beds, only a small number of them found in narrow passages constructed in pillars of nest. Nest therefore pillaged in all probability but a short time before. No queen nor royal cell either to be found.” (Assmuth.)

22-5-1911.—“Big nest on slope at bottom of shrub, the roots of which were found traversing every part of nest. Fungus beds of strangely bluish colour (in other cases simply brown). Though only small part of nest examined, yet 260 guests taken.” (Assmuth.)

25-5-1911.—“Mound on hillside in bushes.” (Assmuth.)

BORIVLI JUNGLE (SALSETTE ISLAND), 25-3-1911.—“In dry tree-trunk completely hollowed out by termites.”

5-4-1911.—“Nest under bamboo shrubs on slope. Upper height of nest (*i.e.*, measured from highest point where mound and slope met,) 1.25m. above ground, lower height more than 2m. Exterior form and fungus beds as on photos 1 and 2.” (Assmuth.)

5-4-1911.—“Nest with broad cupolas at foot of high Targola palm. Fungus beds as on photo 4; as, however, one *Termitoxenia Assmuthi* was taken; I rather think the species to be the common *Termes obesus*. Also some other guests taken in the nest point to the just mentioned species.” (Assmuth.)

5-4-1911.—“Termites under stone.” (Assmuth.)

Aberrant form of a nest.

KHANDALA, 1-5-1911.—“Pretty tall mound on slope, between two trees. Interior of nest quite full of large and small stones, hence most of fungus beds not conical as usual, but some flattened out, others almost cubiform, their forms just fitting into spaces left here and there between stones.” (Assmuth.)

Odontotermes obesus b.

KHANDALA, 2-6-1911.—“Nest on bank of water-course which had dried up after monsoon; river bank about 3 feet high. Upper structure of nest consisting of several very low cupolas each completely separated from the other, the highest of them rising not more than 20 cm. above ground. None of the cupolas showed any perforation, their surface was not smooth, but looked quite weather-worn; in all cupolas an amount of dry grass was found embedded. (Cp. photo 5.) King as well as Queen found after long search, in quite unlooked-for place, about 1 m. from edge of bank and 40 cm. below surface. Though interior of nest showed exceptionally large hollows, yet fungus beds contained therein very small, looking rather like fragments than complete structures. The roof of the beds is a continuous (with large cracks when dried up), slightly convex layer pierced with a number of small holes for the passage of termites (photo 6). *Termitoxenia Assmuthi* in nest which would suggest *Termes obesus*; structure



III.—NEST OF *Odontotermes obesus* RAMB. form *c* (Holmgr.).



IV.—FUNGUS-BEDS OF THE SAME.

TERMITES FROM BRITISH INDIA.

of nest, however, altogether different from last named species." (Assmuth.)

Odontotermes obesus c.

KHANDALA, 24-4-1911.—"Termites under stone." (Assmuth.)

31-5-1911.—"Nest on small plateau near steep hillside. Upper structure of nest rather small, consisting of four or five blunt peaks (photo 3). The latter completely riddled with holes, just like nests found near Kirkee (*Odontotermes brunneus*, Hag.; see below); their structure, however, not so regularly semiglobular. Fungus beds consisting of a number of more or less parallel layers supported by a good many partitions, the whole arranged in much the same way as in Kirkee nests (photo 4). No queen found. Secretions of biting soldiers as strongly staining as those of *Odont. brunneus*.

N. B.—Examined under pocket-lens, the perforation of the peaks of photo 3 is clearly recognizable." (Assmuth.)

7-6-1911.—"Nest of same structure as preceding." (Assmuth.)

10-6-1911.—"Nest on open ground near coriander-shrub. Fungus beds and outer structure same as described above under *Odont. ob. b.* Diameter of surface area of nest between 2 and 3 m., on which I counted about ten rather broad but very low substructures crowned by some sixty small elevations (photo 5); the highest of the latter rose no more than 20 cm. above ground." (Assmuth.)

BORIVLI JUNGLE (SALSETTE ISLAND), 5-3-1911.—"Mound built round base of tree. Perhaps *Termes obesus*, but fungus beds apparently somewhat different from common type (cp. photo 2), rather like photo 4." (Assmuth.)

25-3-1911.—"Mound without turrets at foot of tree. Fungus beds similar to photo 4." (Assmuth.)

5-4-1911.—"Nest with rather broad blunt cupolas, lying by itself on slope by roadside. Fungus beds pretty near type represented on photo 4." (Assmuth.)

Note.—A typical nest of *Odontotermes obesus* is shown in photo 1. Its overground portion consists of a somewhat semiglobular structure, from which rise a number of more or less pointed turrets.

The diameter of this nest is 2.35 m.; the height of the semi-globular structure, without turrets, averages 56 cm.; highest turret measured from roof of substructure, 55 cm.; total height of nest which was situated on a slightly inclined plane, 85 cm. on more elevated side of slope, 110 cm. on lower. Mantle of nest not perforated.

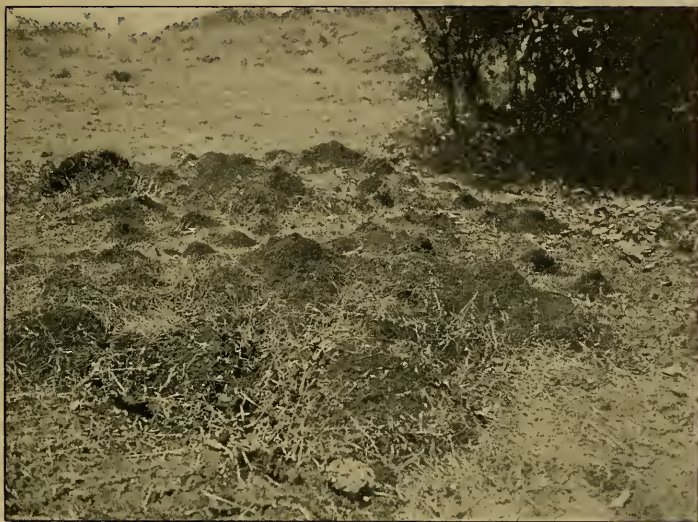
From this normal type the nests of *Odont. ob. c* differ considerably; for the pointed turrets are in this case replaced by small *roundish* cupola-like prominences, the mantle of which is wholly perforated. Moreover the fungus beds within the nest show quite a different formation. If we add to this that the soldiers are a little larger than those of the *a*-nests, with shorter labrum and more strongly developed salivary glands, we should, it would seem, be quite justified in considering the occupants of the *a*- and *c*-nests as two distinct species.

However, this view is contradicted by *Odontotermes obesus b*, the soldiers of which occupy an intermediate position between *a* and *c*, since in *b*-colonies *a*- and *c*-soldiers are found promiscuously. The structure of nest is likewise peculiar in group *b*; its distinctive features are the numerous small prominences or cupolas (cp. with the many turrets of *obesus a*) of low elevation (as in *c*) and completely separated (as in *c*); perforation is absent (as in *a*).

The fourth *c*-nest (examined 10-6-1911; cp. above) is also opposed to the abovementioned view; for it shows the same build as the *b*-nest. Its occupants, however, belong to *O. obesus c*.

The conclusion, therefore, is that the three forms of *obesus* are not entirely distinct biological types; but, as far as I am at present able to judge, the forms merge into one another with regard to their morphological character as well as the structure of their nest.

It is certain, according to Assmuth's information, that *O. obesus* belongs to those species of *Odontotermes* which (like *O. ceylonicus* and *O. Horni*) use secretions of their salivary glands as means of defence.



V.—NEST OF *Odontotermes obesus* RAMB. form *b* [as well as *c*] (Holmgr.).



VI.—FUNGUS-BEDS OF form *b*.

Though our knowledge of the nests of *Odontotermes* is still somewhat defective—we have so far heard nothing of their general plan of construction nor do we know in what manner fungus beds, nursery quarters, etc., are generally arranged—we may nevertheless compare them with the mounds of the closely allied species *Odontotermes Redemanni*. The fresh, newly built nests of the latter remind one forcibly of the young nests of *O. obesus*, the number of their (*O. Red.*) cones, however, being smaller. Later on even these few cones disappear, the intervening spaces between them being filled up by the workers. As an architect, therefore, *O. Redemanni* seems to have proceeded a step further than *O. obesus*. “Chimneys” are never found in nests of *O. obesus*, whereas with *O. Redemanni* they seem to be of rather common occurrence. Now since the nests of *obesus* are quite as large as those of *Redemanni* it stands to reason that the “chimneys” met with in *Redemanni*-nests, though they *may* also serve the purpose of ventilators, are not primarily built for this end; ventilation is, on the contrary, only their secondary function; for surely ventilation would be as necessary for *O. obesus* as for *Redemanni*. Like TRÄGÅRDH, I believe the “chimneys” rather to be passages for transport used by the termites when building nests. They may possibly be found also in fresh nests of *O. obesus*; but this is not at all necessary, since mound-making termites may quite well build nests without constructing any “chimneys” (cp. nests of *Syntermes*).

Odontotermes brunneus. Hag.

IMAGO.—For description see HAGEN, Monographie der Termiten, 1858.

SOLDIER.—Closely resembling *O. ceylonicus*, Wasm., but somewhat larger, with broader head, and mandibles showing a sharper curve. Antennæ of 17 segments, 4th segment longer than 3rd. (In *ceylonicus* of 16 segments, 4th shorter than 3rd). Left mandible, just beyond middle, with large tooth. Tooth of right mandible in same position but small (in *ceylonicus* rudimentary). Labrum rounded off at tip (in *ceylonicus* pointed). Pronotum deeply bilobed anteriorly (in *ceylonicus* slightly bilobed). Head brown-red, dorsal side of abdomen brownish (in *ceylonicus* head yellow-red,

abdomen whitish). Antennæ brown with rings of light colour (in *ceylonicus* whitish).

	<i>O. brunneus</i> , Hag.	<i>O. ceylonicus</i> , Wasm.
Length of abdomen	5.5-6.3 mm.	5.5-6 mm.
" " head with mandibles.	2.96 "	2.85 "
" " " without mandibles	1.85 "	1.74 "
Breadth of head	1.41 "	1.29 "
" " pronotum	1.11 "	1 "

WORKER (two sizes).—Head faintly brownish-yellow (in *ceylonicus* yellow). Antennæ of 18-19 segments¹ (in *ceylonicus* of 16-17 segments²), towards the tip brownish (in *ceylonicus* whitish). Pronotum bilobed anteriorly (same in *ceylonicus*).

	Larger worker.		Smaller worker.	
	<i>O. brunneus</i> .	<i>O. ceylonicus</i> .	<i>O. brunneus</i> .	<i>O. ceylonicus</i> .
Length of abdomen	5 mm.	4.5 mm.	4 mm.	3.5 mm.
Breadth of head...	1.48 "	1.37 "	1.04 "	.92 "
" " pronotum..	.85 "	.78 "	.74 "	.55 "

Collector's report :—

KHANDALA, 21-1-1911.—“In dry cowdung completely perforated and traversed with tunnels by termites. Outer surface of cowdung, and partly also inner wall of tunnels, scantily coated with red earthy material, as is done by many termites when constructing galleries. Nest proper not found.” (Assmuth.)

KIRKEE, 9-5-1911.—“Nest rising about 3 feet above ground, built in garden against brick wall.—The overground portion of

¹ In large workers usually of 19 segments, in small ones always of 18.

² " " of 17 " " of 16.

nests of this species consists of a tolerably solid, more or less semiglobular, base-structure which, however, is apparently not so much impregnated with salivary secretions and consequently not hardened to such a degree as the corresponding part of *obesus*-nests. It rises sometimes as high as 4 feet above ground (in one case I measured even 6 feet) and is crowned by a number of rounded (not pointed as the turrets of *obesus*) domes or cupolas of the height of 1 foot or so. The domes, which are not solid but riddled all over with small holes, are of poor consistence so that one can easily crumble them between the fingers; the holes serve as passages for the termites. The colour of the soil used for constructing the mounds of this species round Kirkee is black (that of *obesus* at Khandala reddish-brown).—Three queens taken in this nest, each enclosed in separate cell; these cells built close together, about 2 feet above ground. No king found in any of the cells, but this failure perhaps to be accounted for by lack of time which made careful search impossible. The fact that queens' chambers were all situated so high above ground makes me believe that the three queens taken by me were received into nest only a couple of years after its foundation, the original royal pair probably having their quarters lower down in nest. I opened merely upper portion of mound, so no chance to come across primitive royal chamber. Fungus beds similar to photo 4. Soldiers when biting secrete drop of milky fluid like those of *O. obesus*; but quantity of liquid secreted by *O. brunneus* more abundant and consequently brown spot appearing on skin after liquid drying up, larger as well as more lasting. Photo 7 shows palm of my right hand taken 4 days after examining this nest. It was only 6 days later that the spots finally disappeared." (Assmuth).

10-5-1911.—"Low mound on flower-bed in garden. Queen about half a foot below surface of ground." (Assmuth).

13-5-1911.—"Mound of moderate size standing by itself in garden. Royal cell with king and queen in middle of nest, level with surrounding ground." (Assmuth).

15-5-1911.—"Very small young nest at foot of babul tree. Queen, with abdomen of strikingly white colour, and king taken." (Assmuth).

15-5-1911.—“Tall mound on open space in small babul-wood. King and queen.—As regards guests taken in this and preceding nests (*Termitoxenia Heimi*, Wasm., *Corythoderus gibbiger*, Wasm., *Chaetopisthes Heimi*, Wasm., etc.), the species tallies well with *Odontotermes obesus*, subsp. *wallonensis*, Wasm.” (Assmuth.)

POONA, May 1911.—“Collected from mounds by S. G. Gadgil, Esq., M. A.” (Assmuth.)

Note.—This species, though doubtlessly very close to *O. ceylonicus*, is, nevertheless, as stated above, well differentiated from it. Biologically the two kinds represent in all probability two different types inasmuch as *O. brunneus* builds mounds of its own, whereas *ceylonicus*, according to ESCHERICH, appears to live as an inquiline in nests of *O. Redemanni* and *obscuriceps*; so far, at any rate, no mounds built by *ceylonicus* have been recorded.

Odontotermes *Feæ*, Wasm.

IMAGO.—Not known.

SOLDIER.—For description, see *Wasmann*, Neue Termitophilen und Termiten aus Indien, 1896.

I make the following additions:—Soldier very like that of *O. Horni*, Wasm. Head, however, more narrowed anteriorly; mandibles shorter and somewhat weaker; tooth of left mandible placed more towards middle, that of right, central, rudimentary; labrum longer, covering half the length of mandibles. Pronotum distinctly bilobed anteriorly.

Length of body	...	...	...	7-8-9 mm.
„ „ head with mandibles	...	...	...	3.7 „
„ „ „ without mandibles	...	...	...	1.74 „
Breadth of head	...	...	...	2.07 „
„ „ pronotum	...	...	...	1.59 „

LARGER WORKER.—Close to worker of *O. Horni*. Fontanelle distinct, but not brown. Antennæ of 19 segments, third shorter than second, yet somewhat longer than fourth. Pronotum slightly bilobed anteriorly. Pilosity plentiful.

Length of body	...	...	6 mm. (Wasm. 5 mm.)
Breadth of head	...	...	1.92 mm.
„ of pronotum	...	...	1.15 „

SMALLER WORKER.—Antennæ of 17 segments, third very short

shorter than fourth, but equal in length to fifth. Pilosity abundant. Pronotum very little bilobed anteriorly.

Length of body ... 4 mm.

Breadth of head... 1.15 „

„ of pronotum81 „

Note.—This species may possibly prove to be merely a race of *O. Horni* of Ceylon.

Collector's Report :—

KHANDALA, 21-1-1911.—“Termites in room where they had eaten up books and woollen goods¹ after covering them with friable crust of red soil. Room on ground-floor; termites had come up from underground through crack in cemented pavement.” (Assmuth.)

7-5-1911.—“Termites in flower pot into which they had found their way, as it had probably been standing in garden over underground nest. Narrow tunnels interrupted at short intervals by small extensions or “chambers”—the size of the latter generally not exceeding that of a monkey-fig—found all through mould in flower pot. Inner walls of tunnels rough, neither smoothed, as with *Odontotermes*, nor blackened, as with *Eutermes biformis*.” (Assmuth.)

25-5-1911.—“Under stone in deep ravine.” (Assmuth.)

8-6-1911.—“Under stone the surroundings of which clearly showed that this is one of the several kinds of white ants which, during night, cover the surface of ground in neighbourhood of nest with friable galleries and more or less extensive coatings of red earthy material; the termites then eat what they have covered—dry grass, leaves, wood, etc.,—and only as much of it as they have covered, leaving any portions outside the crust untouched.” (Assmuth.)

Gen. MICROTERMES, Wasm.

Microtermes obesi, n. sp.

IMAGO.—Very close to *M. sindensis*, Desn.; chiefly differentiated from this species by the dimensions which are somewhat smaller

¹ It is remarkable that cotton goods lying in same shelf were covered by termites with galleries, but otherwise left altogether intact.

in *M. obesi*. The total length of the latter, however, as well as the length of its wings is greater. Colour and pilosity either the same as in *M. sindensis*, or colour somewhat lighter. Compound eyes medium-sized (in *sindensis* small). Ocelli big, but little removed from compound eyes (in *sindensis* of middle size, distant from eyes by half their diameter or more). Antennæ of 15 segments. Pronotum relatively small; anteriorly, in the middle, very little bilobed, but distinctly so posteriorly (in *sindensis* insignificantly). Wing membrane with short hair only in outer half (in *sindensis* whole wing sparsely hairy). Wing at tip somewhat pointed (in *sindensis* rounded off).

	<i>M. obesi</i> , n. sp.	<i>M. sindensis</i> , Desn.
Length with wings	15.5 mm.	14 mm.
„ without wings	9-10 „	8-9 „
„ of forewings	12 „	11 „
„ of head	1.41 „	1.78 „
Breadth of head	1.29 „	1.44 „
„ „ pronotum	1.29 „	1.41 „
Length of „ .. ..	.78 „	.92 „

Habitat.—KHANDALA, 26-4-1911.—Taken in nest of *Odontotermes obesus* a, Ramb.

Microtermes (?) *incertus*, Hag.

It is a discovery of WASMANN (1902), which I am now able to corroborate to some extent, that *Microtermes incertus*, whose original home is presumably Africa, occurs also in India near Bombay; for in the collection before me there are two tubes containing soldiers as well as workers of the *Microtermes* group. They do not differ perceptibly from *Microtermes incertus*, Hag., save that the pilosity of the soldiers' head is a trifle denser and perhaps stiffer than in *incertus*. However this difference is so vague that I dare not attribute any importance to it.

It is, therefore, not impossible that *Microtermes incertus* is met

with in India; still it seems rather surprising seeing that this species is so far known only from Mozambique and Natal. However I do not believe that the resemblance of the soldiers in question with those of *M. incertus* necessarily implies the identity of both kinds. To substantiate my view I shall draw a parallel between the imagines of some African and Indian species. The winged individuals of *M. Trügürdhi* and *M. sindensis* show hardly any difference at all, and their soldiers, I think, will be very nearly alike. Again, *M. incertus* and *M. obesi* differ hardly in any other respect but the number of segments of their antennæ, there being 16 in *incertus*, 15 in *obesi*. The two species are consequently very closely related, which leads me to believe that their soldiers and workers cannot be much different either. It seems to me highly probable that the soldiers and workers before me belong to *M. obesi*, since part of them was found with *Odontotermes obesus* in the same locality as the imagines described above.

Collector's Report :—

KHANDALA, 2-6-1911.—“Termites the galleries of which were constructed in a nest of *O. obesus* form *b.*” (Assmuth.)

8-6-1911.—“Under stone.” (Assmuth.)

MICROCEROTERMES SECTION.

Gen. MICROCEROTERMES, Silv.

Microcerotermes Heimi, Wasm.

Tallies in all castes with co-types from WASMANN'S collection as well as with Ceylon specimens received from GREEN.

Collector's report :—

BORIVLI JUNGLE (SALSETTE ISLAND), 5-2-1911.—“Spherical nest. Proved by experiment that material of which nest is made burns well when put in fire.—I have been unable to discover any regular layers such as shown by you (HOLMGREN, 1906) to exist in South American termite-nests built of wood-carton. The nest of *Microcerotermes Heimi* which is made of extremely hard woody material, presents a pretty uniform labyrinth of small chambers which are connected by minute holes piercing the partitions, just sufficiently large to allow the termites to pass through. The outer surface is here and there covered with patches of a thin crust of

reddish earthy material; the royal cell is situated rather more downwards, not in the centre. Eggs are, of course, found in greater quantities in chambers in the neighbourhood of the royal cell, but I could not convince myself that they were limited to a definite space which might rightly be termed a "zone".—Number of workers, as is always the case in this species, very great, that of soldiers rather small." (Assmuth.)

25-3-1911.—"Spherical nest of very tough woody material. Nest not perfectly spherical, but somewhat elongate. Greater axis 24-28 cm., smaller 15-20 cm. Nest built just above surface of ground on withered bamboo-stump, as is apparently the rule with this species." (Assmuth.)

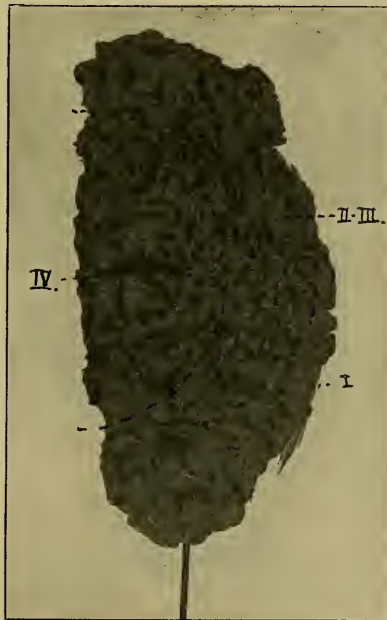
5-4-1911.—"Spherical nest. Fully developed queen in royal cell, but no king. The latter, in fact, never found in any of the many nests examined. In a number of nests of this species the royal cell was found, but no queen in it, though nest was otherwise crammed full of termites." (Assmuth.)

5-4-1911.—"Spherical nest containing double (two-storied) royal cell, the one situated above the other, both separated by simple flat partition forming ceiling of lower, and bottom of upper, cell, pierced with a fair number of small holes for passage of workers and soldiers. No fewer than 13 queens, but no king. Though queens here of different size, yet all of them smaller than those found singly in other nests. Dimensions of nest about the same as stated above." (Assmuth.)—Assmuth is right in believing that the queens are neoteinic; the species consequently belongs—together with *Armitermes neotenicus*, Holmg.—to those which construct special chambers for the neoteinic individuals.

Note.—The build of *Microcerotermes* nests might perhaps be taken as a proof that they have followed a line of development different from that of the *Eutermes*-nests of South America which I have described. The study of portions of nests of *M. papuanus* and *M. Biroi* from New Guinea, which I made some time ago, convinced me that such was the case. This fact can not be surprising, since *Microcerotermes*, morphologically, belongs to quite another line of descent than *Eutermes*; and, as a matter of fact,



VII.—HAND COVERED WITH BROWN SPECKS FROM BITES OF SOLDIERS OF
Odontotermes brunneus HAG.

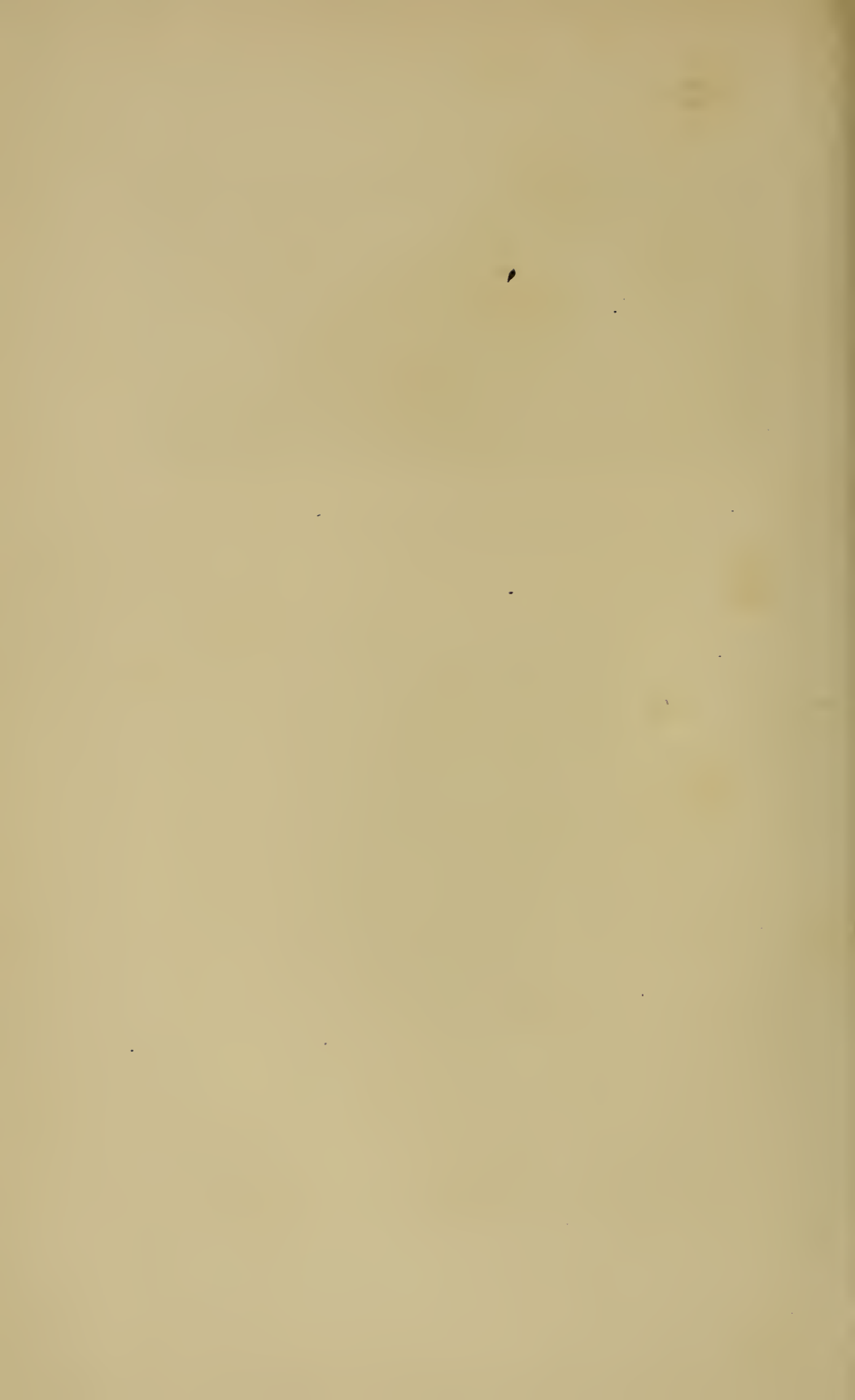


VIII.—SECTION THROUGH PART OF NEST OF *Microcerotermes Heimi* WASM.

I—Coating zone; II and III—Outer zone (not differentiated);

IV—Nursery zone (central zone absent).

TERMITES FROM BRITISH INDIA.



the portions of the nests just mentioned do not show an arrangement in layers analogous to what we observe in *Eutermes*-nests. This being the case, it would be highly remarkable if a *Microcerotermes*-nest was really discovered in which an arrangement in layers or zones similar to that of *Eutermes*-nests could be shown to exist; for the practice of building such a type of nest would doubtlessly be the result of parallel lines of development.

Now Assmuth has sent me two portions of the second nest mentioned above (see collector's report); one of the fragments—the more interesting of the two—a piece 7.5 cm. thick, is taken from the outer part of the nest, the other is the innermost portion of it with the royal cell. To my surprise I recognise in the first fragment a distinct stratification, *viz.* 1. A coating zone (zone I; cp. HOLMGREN, Studien ueber suedamerikanische Termiten, 1906), consisting of very minute pellets of earthy material, the exterior of which is not smoothed. The zone is irregularly rough and warty, forming the outside wall of the external layer of cells or chambers. 2. An outer zone (zone II and III). This layer contrasts with the interior of the nest by its very colour, its walls being lined with a sort of brownish-black coating of excrements, whereas the walls of the interior are lined yellowish-brown. Moreover, the chambers of this zone are, on the whole, smaller than those of the interior. They also seem to extend in a more tangential direction, at least in the lower portions of the zone in question. The latter is not built regularly, nor is the form of its cells well definable in all parts; but the colour of its interior lining enables us to fix its limits without any difficulty. The thickness of the layer is about 3 cm. 3. A nursery zone (zone IV.) Its walls are lined with a yellowish-brown coating. The chambers, though very irregular, show a more or less marked horizontal position. Round the royal cell their arrangement appears to be somewhat concentric, but without any regularity. The queen is found in this layer in a big (3-4 cm. broad) rather flat-roofed chamber with perforated walls. A central zone (Zentralkern) would, therefore, seem to be absent.

The general build of the nest appears from the accompanying photograph (No. 8).

Hence I am of opinion that, in the case of the *Microcerotermes*-nest under discussion, a stratification has been proved to exist which is substantially the same as in the nests of the *Syntermes-Eutermes*-section. It may well be supposed that such a conformity goes back to primeval conditions, and hence it is likewise conceivable that the case before us is the expression of instincts of nest-building which had been developed even in the *Mesotermitidæ*. But when we examine the construction of nests of the *Mesotermitidæ* as it appears to-day, we find concentric nests only in the *Coptotermitinæ*, a subfamily which can nowise be considered as the starting point of development either for the *Syntermes*—or the *Microcerotermes*-section. Our present knowledge of the *Mesotermitidæ*, then, proves that neither for *Eutermes*—nor *Microcerotermes*-nests a common form of concentric nests can be pointed out as the primitive type. Consequently we must for the time being assume that the conformity of stratification in the nests of the above-named sections is based on parallel development of the instincts of nest-building.

HAMITERMES SECTION.

Gen. HAMITERMES, Silv.

Subgen. SYNHAMITERMES, n. subg.

Hamitermes (Synhamitermes) quadriceps, Wasm.

I have before me both soldiers and workers.

Collector's Report :—

KHANDALA, 31-5-1911.—“Termites the flat broad tunnels of which were constructed in the pillars of a nest of *O. obesus* form *c.*” (Assmuth.)

Note.—The new subgenus *Synhamitermes* will be defined later on in my “Termitenstudien.” I include in it, together with *H. quadriceps*, *H. brevicorniger* from South America.

MIROTERMES SECTION.

Gen. CAPRITERMES, Wasm.

Capritermes incola, Wasm.

Soldiers as well as workers are in my possession; they do not differ from Ceylonese specimens.

Collector's Report :—

KHANDALA, 22-5-1911.—“Tunnels in pillars of nest of *O. obesus* form *a.*” (Assmuth.)

10-6-1911.—“Under stone.” (Assmuth.)

SYNTERMES SECTION.

Gen. EUTERMES, Fr. Mueller.

Eutermes biformis, Wasm.

Tallies perfectly with specimens from Ceylon.

Collector's Report :—

BORIVLI JUNGLE (SALSETTE ISLAND), 5-4-1911.—“In small galleries built on surface of bare ground.” (Assmuth.)

KHANDALA, 4-5-1911.—“Under broad stone on top of mountain, approximately 2,700 feet above level of sea. Inner walls of tunnels as well as lower side of stone with deep-black grained surface, like shagreened leather.” (Assmuth.)

4-5-1911.—“Nest near preceding one, under stone. The whole mountain (Fernhills) apparently occupied by this species; I found the termites under nearly every stone I turned.” (Assmuth.)

29-5-1911.—“Under stone in deep ravine.” (Assmuth.)

29-5-1911.—“Under stone not far from preceding nest.” (Assmuth.)

2-6-1911.—“Nest under stone. This is the only case in which I observed a *Eutermes*-nest having some sort of overground structure—a clod of dry mud beside stone covering main nest was traversed by numerous black-coated galleries so characteristic of *Eutermes biformis*. The clod was about 10 cm. high and had a surface diameter of 20-30 cm.” (Assmuth.)

2-6-1911.—“Under stone close by preceding nest.” (Assmuth.)

Note.—Previously known from Ceylon as well as Bombay.

(*To be continued.*)

A MONOGRAPH OF THE WASPS OF THE GENUS
CERCERIS INHABITING BRITISH INDIA.

WITH NOTES ON OTHER ASIATIC SPECIES.

BY

ROWLAND E. TURNER, F.Z.S., F.E.S.

(Continued from page 516 of this Volume.)

PART II.

(With Plates C & D.)

Cerceris pruinosa Morice.

Cerceris pruinosa Morice Trans. Ent. Soc. London, p. 303, 1897. ♀.

♀. Pallide flava, vertice mesonotoque nigro-maculatis; flagello segmentisque abdominalibus apice anguste ferrugineis; clypeo dimidio apicali subconcavo, angulis producto; segmento ventrali secundo area basali elevata lata; segmento mediano area basali nitida.

Long. 10 mm.

♀. Clypeus about half as broad again at the apex as long, the apical half subconcavely depressed, widely and shallowly emarginate on the apical margin and produced at the angles. Antennæ inserted a little further from the anterior ocellus than from the base of the clypeus, second joint of the flagellum scarcely longer than the third. Posterior ocelli as far from the eyes as from each other. Pronotum depressed in the middle; mesopleuræ without tubercles. First abdominal segment broader than long; the raised area at the base of the second ventral segment broad; pygidial area ovate, much broader at the base than at the apex. Shallowly and sparsely punctured on the dorsal surface of the thorax, more closely and deeply elsewhere; the enclosed area at the base of the median segment smooth, but not highly polished, with a median groove. Fifth ventral segment widely emarginate at the apex. Wings hyaline; first recurrent nervure received before one-third from the base of the second cubital cell.

Habitat.—Quetta (*Nurse*). July.

Originally described from Abbasiyeh in Egypt; also taken by Mr. Eaton at Biskra, Algeria.

Cerceris spectabilis Rad.

Cerceris spectabilis Rad. Horæ Soc. Ent. Ross. XX, p. 36, 1886.

♀. Flava; abdomine incisuris ferrugineis; flagello testaceo; vertice, mesonoto, areaque basali segmenti mediani nigris; clypeo supra dimidium

apicalem subimpresso, apice truncato, mesopleuris tuberculo acuto, segmento ventrali secundo area basali haud valde elevata, segmento mediano area basali nitido; alis hyalinis, apice leviter infumatis.

♂. Feminae similis; abdomine incisuris nigris, clypeo latitudine fere sesqui longiore, apice truncato.

Long. ♀ 7 mm., ♂ 6 mm.

♀. Clypeus flattened or feebly impressed from before the middle to the apex, the apical margin broadly truncate. Antennae inserted almost as far from the base of the clypeus as from the anterior ocellus, the second joint of the flagellum less than half as long again as the third. Posterior ocelli further from the eyes than from each other, the eyes slightly divergent towards the clypeus. Mesopleurae with an acute tubercle; first abdominal segment as long as broad; second ventral segment with a feebly raised area at the base. Pygidial area nearly twice as long as the greatest breadth, rounded at the apex, the sides almost parallel. Head and thorax finely and sparsely punctured; the enclosed area at the base of the median segment shining, divided by a longitudinal groove: the sides of the median segment, mesopleurae and abdomen coarsely and rather closely punctured. First recurrent nervure received before one-third from the base of the second cubital cell.

♂. Clypeus nearly half as long again as broad, truncate at the apex; mesopleurae without a spine; first abdominal segment longer than broad; pygidial area nearly half as long again as broad.

Habitat.—Quetta (Nurse). July.

Cerceris pulchella Klug.

Cerceris pulchella Klug. Symb. Physic., 1845. ♂; Schlett. Zool, Jahrb, II, p. 391, 1887. ♂, ♀.

♀. Flava, macula circa ocellos, mesonotoque nigris; flagello, pygidio, segmentisque dorsalibus basi pallide ferrugineis; alis hyalinis, apice infuscatis; clypeo convexo, apicem versus triangulariter truncato, mesopleuris tuberculatis, segmento ventrali secundo area basali elevata, area basali segmenti mediani nitida.

Long. 10 mm.

♂. Flavus, vertice, mesonoto, area basali segmenti mediani, segmentisque abdominalibus basi nigris; flagello pallide ferrugineo; clypeo latitudine sesqui longiore, apice truncato.

♀. Clypeus convex, with a small oblique triangular truncation at the apex, the middle lobe as long as broad and truncate at the apex. Antennae inserted high up on the front, as far from the base of the clypeus as from the anterior ocellus, the second joint of the flagellum less than half as long again as the third. Cheeks not quite as broad as the greatest breadth of the eye. Mesopleurae with a distinct tubercle; first

abdominal segment as long as broad; second ventral segment with a raised area at the base; pygidial area pyriform, much narrowed at the apex. Head and thorax finely punctured, thorax and median segment shining and very sparsely punctured; the triangular area at the base of the median segment smooth and shining, with a shallow median groove; abdomen more strongly punctured. First recurrent nervure received just beyond one-third from the base of the second cubital cell.

♂. Middle lobe of the clypeus about half as long again as broad, truncate at the apex, slightly convex. Antennæ inserted a little nearer to the anterior ocellus than to the base of the clypeus. First abdominal segment longer than broad by about one quarter; pygidial area as broad at the base as long, narrowed to the apex, where it is not more than two-thirds of the breadth at the base, the apical margin truncate. More strongly punctured than the female, especially on the thorax and median segment; the triangular area at the base of the median segment as in the female. The first recurrent nervure is received just before one-third from the base of the second cubital cell.

Habitat.—Quetta (Nurse).

Originally described from Egypt.

I feel confident that this is the species described as *pulchella* by Schletterer, but do not consider that his identification is beyond doubt. A specimen in the Oxford University Museum, collected by Captain Boys, seems to be identical in structure and sculpture but differs remarkably in colour; the ground colour being black without any ferruginous markings, and the yellow bands on the abdomen are reduced in size and differ in shape.

Cerceris dentata Cam.

Cerceris dentata Cam. Mem. Manchester Lit. Phil. Soc. (4) III, p. 260, 1890. ♀.

♀. Nigra; clypeo, fronte, scapo, macula pone oculos, pronoto, tegulis, mesopleuris macula, scutello utrinque, postscutello, segmento mediano linea lata utrinque, segmento abdominali primo macula parva utrinque, segmentis secundo tertioque fascia angusta apicali, quinto fascia lata tibis tarsisque flavis; segmento abdominali primo femoribusque ferrugineis; alis hyalinis, apice vix infumatis; clypeo concavo, apice late truncato; mesopleuris dentibus binis approximatis armatis; segmento mediano area basali nitida, sparsissime punctata; segmento ventrali secundo area basali elevata.

Long. 8 mm.

♀. Clypeus broad, concave on the apical two-thirds, broadly truncate at the apex. Antennæ inserted nearly half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum more than half as long again as the third. Eyes diverging very slightly

towards the clypeus; posterior ocelli a little further from the eyes than from each other, and further from the posterior margin of the head than from the eyes. Mesopleuræ with two stout teeth placed close together; first abdominal segment as long as broad; second ventral segment with a raised area at the base; fifth ventral segment widely emarginate at the apex; pygidial area ovate, twice as long as the greatest breadth. Rather deeply punctured; more closely and finely on the head; enclosed area at the base of the median segment smooth and shining, with very few large punctures and a well marked median groove. First recurrent nervure received just beyond one-quarter from the base of the second cubital cell.

Habitat.—Barrackpore (*Rothney*). According to Bingham also from Poona.

Cerceris quettaensis Cam.

Cerceris quettaensis Cam. Ann. and Mag. Nat. Hist. XX., p. 85., 1907.

♀. Nigra; clypeo, fronte, scapo, macula post oculos, rapronoto utrinque, mesopleuris maculis duabus, tegulis, postscutello, segmento mediano utrinque pedibus, segmento secundo dorsali fascia basali tertio quintoque fere totis, quarto fascia antice late emarginata, segmentisque ventralibus 2-5 flavis; clypeo dimidio apicali impresso, apice truncato; mesopleuris spinis duobus acutis; segmento mediano area basali nitido; alis hyalinis, apice leviter infuscatis; segmento ventrali secundo area basali elevata.

Long. 13 mm.

♂. Feminæ similis; clypeo latitudine paullo longiore, apice truncato, mesopleuris tuberculatis.

Long. 12 mm.

♀. Clypeus a little broader than long, broadly truncate at the apex, the apical half very slightly concave. Antennæ inserted fully half as far again from the anterior ocellus as from the base of the clypeus; the second joint of the flagellum nearly half as long again as the third. Mesopleuræ with two acute spines; first abdominal segment as long as broad; second ventral segment with a raised area at the base; pygidial area broadest at the base, half as long again as the greatest breadth, rather narrowly rounded at the apex. Coarsely punctured, the space at the base of the median segment smooth and shining, with very short striæ at the sides, divided by a deep longitudinal groove. First recurrent nervure received before one-third from the base of the second cubital cell.

♂. Clypeus a little longer than broad, truncate at the apex. Antennæ inserted as far from the base of the clypeus as from the anterior ocellus, the apical joint not curved and no longer than the penultimate. Mesopleuræ with two tubercles, the posterior one acute, but not as long as in the female. First abdominal segment longer than broad.

Habitat.—Quetta (*Nurse*). May.

Cerceris comberi sp. n.

♀. Flava; vertice, mesonoto, areaque triangulari segmenti mediani nigris; flagello, segmento dorsali primo, secundo apice quartoque basi rufis alis leviter infuscatis; clypeo apice fere transverso, ante apicem transverse impresso, segmento ventrali secundo area basali elevata.

Long. 12 mm.

Clypeus concave, broadly truncate or subemarginate at the apex, with a transverse depressed line before the apex. Antennæ inserted more than half as far again from the anterior ocellus as from the base of the clypeus, the third joint of the flagellum as long as the second. Head broad, the cheeks broader than the greatest breadth of the eyes, without a spine. Eyes diverging towards the clypeus. Pronotum not depressed in the middle, the posterior angles prominent; mesopleuræ without spines. First abdominal segment almost quadrate, second ventral segment with a small raised area at the base; fifth ventral segment raised broadly on the apical margin, with a deep depression before the raised space; pygidial area broad, less than twice as long as the greatest breadth, slightly broadened to the middle and rather broadly truncate at the apex. Closely but not very deeply punctured; the enclosed area at the base of the median segment obliquely striated at the sides, almost smooth in the middle, the median groove broad and transversely striated. First recurrent nervure received a little before the middle of the second cubital cell.

Yellow; the vertex, ocellar region, mesonotum, extreme apex of the scutellum and the enclosed area at the base of the median segment black; an oblique yellow band on each side on the vertex; flagellum, first dorsal segment, apex of second segment broadly and the base of the fourth segment more obscurely pale rufo-ferruginous. Wings dusky fulvo-hyaline stained with fuscous at the apex.

♂. The ferruginous colour on the second and fourth dorsal segments is replaced by black, which is sometimes also the case in the female; the clypeus is longer than broad, convex at the base, truncate at the apex; first abdominal segment nearly twice as long as broad.

Habitat.—Karachi (*Comber*). October. Mysoore (sic) Oxford University Museum, ex. coll. Westwood.

This seems to be very near *histrionica* Klug, but the petiole of the male is longer in the present species according to Klug's figure.

Cerceris albopicta Sm.

Cerceris albopicta Sm. Ann. & Mag. Nat. Hist. (4) XII, p. 412, 1873.

♀. Nigra; clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, mesopleuris maculis duabus, segmento dorsali secundo basi macula utrinque, ventrali macula utrinque apice, segmentis tertio quintoque fascia apicali emarginata, pedibusque albidis; flagello segmentisque abdominalibus

1—3 ferrugineis; alis hyalinis, apice infumatis; clypeo plano, apice late truncato, mesopleuris laud tuberculatis; segmento mediano area basali nitida, lateribus breviter oblique striata; segmento ventrali secundo area basali elevata.

♂. *Feminæ similis*; segmento abdominali primo solo ferrugineo; clypeo apice truncato, convexo; segmento mediano area basali lateribus punctata vel striata.

Long. ♀, 11-14 mm.; ♂, 9 mm.

♀. Middle lobe of the clypeus about half as broad again at the apex as long, flat, the apex broadly truncate and very slightly porrect. Antennæ inserted almost as near to the anterior ocellus as to the base of the clypeus, the second joint of the flagellum very slightly longer than the third. Eyes distinctly diverging towards the clypeus; posterior ocelli further from the eyes than from each other. Mesopleuræ without tubercles; first abdominal segment as long as broad; second ventral segment with a raised area at the base; fifth ventral segment widely emarginate at the apex, depressed at the base; pygidial area elongate ovate, narrowly truncate at the apex, twice as broad at the base as at the apex and about twice as long as the greatest breadth. Closely punctured, more deeply on the abdomen than on the thorax, median segment and mesopleuræ rugose; enclosed area at the base of the median segment smooth and shining, with short oblique striæ on the sides, the median groove transversely striated. First recurrent nervure received just before the middle of the second cubital cell.

♂. Clypeus longer than broad, truncate at the apex. Apical joint of the flagellum shorter than the penultimate, very slightly curved. Enclosed area at the base of the median segment smooth and shining, often with a few punctures or striæ at the sides; first abdominal segment much longer than broad; the raised area at the base of the second ventral segment distinct; pygidial area longer than broad, a little broader at the base than at the apex; first recurrent nervure received close to the base of the second cubital cell. Second ventral segment evenly punctured in both sexes.

Habitat.—W. India; Bombay to Quetta.

This is one of the few Indian species found at Quetta.

Cerceris wickwari sp. n.

♀. Nigra, clypeo, fronte, prothorace macula utrinque, segmento abdominalibus tertio quintoque fascia apicali, tegulis, tibiis tarsisque flavis; segmento abdominali primo rufo; clypeo subconcavo, apice truncato, segmento ventrali secundo area basali elevata, segmento mediano area basali punctata, in angulis striata.

Long. 9 mm.

♂. *Feminae similis*; clypeo apice truncato, convexo.

♀. Clypeus concave on the apical half, broadly truncate at the apex. Antennæ inserted a little nearer to the base of the clypeus than to the anterior ocellus, the second joint of the flagellum equal to the third. Cheeks a little more than half as broad as the eyes. Pronotum not depressed in the middle, rounded at the angles; mesopleuræ without spines. Basal abdominal segment a little longer than broad, constricted at the apex. Second ventral segment with a raised area at the base; pygidial area elongate ovate, narrowly truncate at the apex. Strongly punctured, more closely on the head than elsewhere; the enclosed area at the base of the median segment punctured, obliquely striated in the angles and at the apex, with a deep median groove. First recurrent nervure received at one-fifth from the base of the 2nd cubital cell. Black; mandibles, except at the apex, clypeus, front, a spot on each side of the pronotum, tegulæ, a small spot at the anterior angles of the scutellum, a narrow apical band on the third dorsal abdominal segment, another on the fifth, the whole of the third ventral segment, a spot on each side of the fifth, tibiæ and tarsi yellow; first abdominal segment and second ventral segment ferruginous red, antennæ testaceous brown, the scape yellow beneath. Wings hyaline, with a very faint fuscous cloud at the apex, nervures testaceous.

♂. As in the female; but the clypeus is longer than broad, narrowly truncate at the apex; the pygidial area very small, coarsely punctured, truncate at the apex, twice as long as the greatest breadth, very slightly narrowed towards the apex.

Habitat.—Ceylon, Colombo (*Wickwar*). July to September, March to April.

In structure this resembles the last species (*allopicta*), but the second ventral segment is not evenly punctured, being almost smooth at the apex. The size and colour are also different.

Cerceris rybiensis Linn.

Sphex rybiensis Linn. Pand and Flora Rybijensis, p. 8, 1771.

Cerceris rybiensis Schlett. Zool. Jahrb. II, p. 375, 1887.

Cerceris kashmirensis Nurse Ann. and Mag. Nat. Hist. (7) XI, p. 524, 1903.

♀. Nigra; clypeo, fronte, pronoto utrinque, tegulis, postscutello, segmento abdominali secundo basi, tertio, quarto quintoque fascia apicali antice emarginata flavis, antennis ferrugineis vel nigris, pedibus testaceis flavo-variegatis; clypeo apice truncato, supra dimidium apicalem impresso: mesopleuris hand tuberculatis; segmento ventrali secundo area basali elevata; segmento mediano area basali in angulis striata; alis subhyalinis, nervulis fuscis vel testaceis.

♂. *Feminae similis*; clypeo apice anguste truncato, latitudine longiore.

Long. ♀, 12 mm.; ♂, 9 mm.

♀. Clypeus broader than long, broadly truncate at the apex, a concave depression reaching from the apex to beyond the middle, the apical margin slightly recurved. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum very slightly longer than the third. Eyes slightly diverging towards the clypeus; posterior ocelli further from the eyes than from each other. Mesopleuræ without tubercles; first abdominal segment broader than long; second ventral segment with a raised area at the base; pygidial area elongate ovate, broader at the base than at the apex. Closely and rather coarsely punctured; the enclosed area at the base of the median segment opaque, striated in the corners and divided by a median groove. First recurrent nervure received at one-third from the base of the second cubital cell.

♂. Clypeus longer than broad, rather narrowly truncate at the apex. First abdominal segment longer than broad.

Habitat.—Kashmir 5—6,000 ft. (*Nurse*). May and June. Simla (*Nurse*). August and September.

The male from Simla has the apex of the clypeus black. *C. fortunata* Cam. is very near this species.

Cerceris fortunata Cam.

Cerceris fortunata Cam. Ann. and Mag. Nat. Hist. X., p. 57, 1902. ♂.

Cerceris unifasciata Bingham. ♀ (nec ♂, nec Smith), Fauna Brit. India. Hym. I., p. 310, 1897.

Cerceris aureobarba Cam. Ann. and Mag. Nat. Hist. (7) XV, p. 221. 1905. ♂.

♀. Nigra; clypeo et fronte flavis; pronoto utrinque, tegulis, post-scutello, tibiis, tarsis, segmentis dorsalibus tertio quintoque fascia apicali ochraceis; clypeo apice truncato, dimidio apicali plano; segmento mediano area basali longitudinaliter striata; segmento ventrali secundo area basali elavata.

Long. 9—12 mm.

♂. Feminæ similis; clypeo convexo, apice truncato, margine apicali late nigro.

Long. 8—9 mm.

♀. Clypeus broader than long, broadly truncate at the apex, the apical half flattened, but not concave. Antennæ inserted more than half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum only slightly longer than the third. Eyes parallel on the inner margin, posterior ocelli nearly twice as far from the eyes as from each other. Pronotum not impressed in the middle; mesopleuræ without tubercles; first abdominal segment longer than broad; second ventral

segment with a raised area at the base; pygidial area ovate, much broader at the base than at the apex, very narrowly truncate at the apex, granulate. Closely and deeply punctured, the enclosed area at the base of the median segment longitudinally striated, divided by a longitudinal groove. First recurrent nervure received at one-quarter from the base of the second cubital cell. Wings hyaline, strongly clouded with fuscous at the apex and in the radial cell.

♂. Clypeus longer than broad, convex and truncate at the apex. Apical joint of the flagellum not curved, shorter than the penultimate. First recurrent nervure received nearer to the base of the second cubital cell than in the female.

Habitat.—Northern India and Burma.

Bingham has taken his description of *unifasciata* from Smith's type, which came from North China and is not identical with the Indian species for which Cameron's name must stand. Bingham's short description of the female is apparently taken from an Indian specimen of the present species. The form of the clypeus in the male is quite different in the two species. I do not know that true *unifasciata* occurs in India. *C. aureobarba* Cam. is undoubtedly a synonym, and must sink, as is the case with most of the species of *Cerceris* described in the same paper.

Cerceris emarginata Panz.

Philanthus emarginatus Panz. Fann. Insect. German. VI, 1799.

Cerceris emarginata Spin. Insect. Ligur. I., p. 97, 1806.

♀. Nigra, clypeo, fronte, scapo, pronoto macula utrinque, tegulis, postscutello, segmento mediano macula parva utrinque, pedibus, segmento dorsali secundo basi, tertio, quarto, quintoque late flavis; alis hyalinis apice infuscatis; clypeo latitudine longiore, parte apicali depresso, apice truncato, segmento ventrali secundo area basali elevata; segmento mediano area basali basi longitudinaliter striata.

♂. Feminæ similis; segmento sexto flavo-fasciato, clypeo latitudine fere duplo longiore, apice truncato.

Long. ♀ 9 mm., ♂ 7 mm.

♀. Clypeus as long as broad, the apical half depressed, broadly truncate at the apex. Second joint of the flagellum longer than the third; mesopleuræ not tuberculate; first abdominal segment longer than broad, second ventral segment with a raised area at the base; pygidial area elongate ovate, nearly twice as broad at the base as at the apex. Strongly and closely punctured; the enclosed area at the base of the median segment longitudinally striated at the base, finely punctured at the apex, with a deep median groove.

The abdominal yellow fasciæ are not emarginate anteriorly.

Habitat.—Quetta (Nurse). May. Pishin (Nurse). April.

This common species is found throughout Central and Southern Europe and Turkestan.

Cerceris compta sp. n.

♀. Nigra; flagello subtus testaceo; segmento abdominali primo rufo-ferrugineo; clypeo, fronte, scapo, pronoto, tegulis, mesopleuris, scutello, postscutello, segmento mediano utrinque plus minus maculato, segmento dorsali secundo dimidio basali, tertio antice emarginato, quinto, ventralibus 2—5, pedibusque flavis; alis hyalinis, apice vix infumatis; clypeo basi modice convexo, dimidio apicali leviter impresso, apice late truncato; mesopleuris haud tuberculatis; segmento mediano area basali nitida, lateribus punctata; segmento ventrali secundo area basali elevata.

Long. 8 mm.

♀. Clypeus broadly truncate at the apex; a little convex at the base, the apical half slightly impressed. Antennæ inserted about one-quarter further from the anterior ocellus than from the base of the clypeus, the second joint of the flagellum nearly half as long again as the third. Eyes parallel; posterior ocelli nearly as far from each other as from the eyes. First abdominal segment about as broad at the base as long, narrowed at the apex; second ventral segment with a raised area at the base; pygidial area ovate, narrower at the apex than at the base, rather more than half as long again as the greatest breadth. Closely but not coarsely punctured; the enclosed area at the base of the median segment smooth and shining, with a median groove, sometimes with a few punctures on the sides. First recurrent nervure received at one-third from the base of the second cubital cell.

Habitat.—Karachi (Comber). October.

In colour this resembles *rufo-nodis* Rad., which has been given, whether rightly or not I do not know, as a synonym of *rubida* Jur. The scheme of colouring seems to be common to several species in Western Asia, and the present species is undoubtedly distinct from *rubida*.

Cerceris protea sp. n.

Cerceris protea Nurse m. s.

♂. Nigra; clypeo, fronte, scapo, genis, pronoto, tegulis, mesopleuris, scutello, postscutello, segmento mediano utrinque, segmento secundo basi, tertio macula nigra basali quarto quintoque fascia lata emarginata, pedibusque flavis; segmento primo, flagelloque ferrugineis; alis hyalinis, apice infuscatis; clypeo plano, apice late truncato; mesopleuris haud dentatis; segmento mediano area basali nitida, lateribus obscure striata; segmento ventrali secundo area basali elevata.

♂. Feminae similis; genis nigris, flavomaculatis; clypeo latitudine longiore, apice truncato.

Long. ♀, 10 mm; ♂, 7-9 mm.

♀. Clypeus flat, as broad at the apex as long, the apical margin straight. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum no longer than the third. Eyes very slightly divergent towards the clypeus; posterior ocelli as far from the eyes as from each other. Mesopleuræ without tubercles; first abdominal segment slightly broader than long; second ventral segment with a raised area at the base; pygidial area narrow, elongate ovate, about three times as long as the greatest breadth, narrowly rounded at the apex. First recurrent nervure received at about one-quarter from the base of the second cubital cell. Closely and not very coarsely punctured; the enclosed area at the base of the median segment smooth and shining, with short, obscure striæ on the sides, the median groove transversely striated.

♂. Clypeus truncate at the apex, longer than broad; apical joint of the flagellum shorter than the penultimate, not curved; first abdominal segment as in the female; pygidial area about half as long again as broad, the sides almost parallel.

Habitat.—Deesa and Abu (*Nurse*).

Cerceris novaræ Sauss.

♀. *Cerceris pictiventris* Dahlb. Hymen. Europ. I., p. 498, 1845; Bingham. Fauna Brit. India Hym. I., p. 305, 1897.

Cerceris novaræ Sauss. Reise d. Novaræ Zool. II., p. 92, 1867. ♀; Camm. Mem. Manchester Lit. Phil. Soc. (4) III, p. 257, 1890. ♂ ♀.

Cerceris fervens Sm. Ann. Mag. Nat. Hist. (4) XII, p. 411, 1873.

♀. Nigra; clypeo, fronte, scapo, pronoto macula utrinque, tegulis, post-scutello, mesopleuris macula magna, segmento mediano macula magna utrinque, segmento secundo dorsali basi, tertio quintoque fascia apicali late emarginata, segmentis ventralibus 2-5, pedibusque flavis, clypeo plano, latitudine longiore, apice truncato, mesopleuris haud tuberculatis; segmento mediano area basali nitida, apice rugose striata; segmento ventrali secundo area basali elevata; alis hyalinis, apice infumatis.

♂. Feminae similis; clypeo apice late rotundato; mesopleuris haud flavopictis; segmentis ventralibus 4-6 nigris.

Long. ♀, 9-11 mm.; ♂, 8-10 mm.

♀. Clypeus a little longer than broad, flattened in the middle and truncate at the apex. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum scarcely longer than the third. Eyes almost parallel, very slightly divergent towards the clypeus, posterior ocelli a little further from the eyes than from each other. Mesopleuræ without tubercles; first abdominal segment longer than broad; second ventral segment with a raised area at the base; pygidial area elongate ovate, broader at the base than at the

apex, twice as long as the greatest breadth. Coarsely punctured; the enclosed area at the base of the median segment smooth and shining, with a broad, transversely striated median groove, and a few striations at the apex.

♂. Clypeus very broadly rounded at the apex, almost truncate, slightly convex. Antennæ inserted as near to the anterior ocellus as to the base of the clypeus, the apical joint no longer than the penultimate, not curved. Pygidial area about half as long again as broad.

Habitat.—The whole of India, Burma and Ceylon; but not extending beyond the eastern edge of the Rajputana desert in a North-westerly direction.

As I have not seen specimens of *pictiventris* from Java, I think it safer to use Saussure's name for this species, though it will very likely prove that it is identical with *pictiventris*. Specimens from Sarawak have the pygidial area of the female broader than in *novaræ*, and the abdomen in both sexes is a little broader in proportion; these will probably prove to be nearer the typical form.

Cerceris boysi sp. n.

♀. Nigra; clypeo, fronte, scapo, pronoto in medio interrupto, tegulis, macula pone oculos, mesopleuris macula, scutello, postscutello, segmento medio macula apicali utrinque, segmentis dorsalibus 2-3, macula transversa magna utrinque, ventralibus 2-3 fascia lata, dorsalibus 4-5 fascia apicali, pedibusque eburneis; alis hyalinis, apice infumatis; stigmatibus testaceo; clypeo subquadrato, apice truncato, dentibus binis minutissimis armato; mesopleuris haud tuberculatis; segmento medio area basali nitida; segmento ventrali secundo area basali elevata.

Long. 6 mm.

♀. Clypeus slightly convex, as long as broad, truncate at the apex, with a very minute tooth on each side. Antennæ inserted about one-quarter further from the anterior ocellus than from the base of the clypeus, the second joint of the flagellum half as long again as the third. Eyes parallel, posterior ocelli half as far again from the eyes as from each other. Pronotum slightly depressed in the middle; mesopleuræ without tubercles; first abdominal segment subquadrate; second ventral segment with a raised area at the base; pygidial area ovate, broader at the base than at the apex, nearly twice as long as the greatest breadth and narrowly truncate at the apex. Punctured, coarsely, but not very closely on the abdomen, more finely on the head and thorax; the enclosed area at the base of the median segment smooth, with one or two large punctures and a deep median groove. First recurrent nervure received at one-sixth from the base of the second cubital cell.

Habitat.—India (*Boys*).

Type in Oxford University Museum ex coll. Westwood.

Captain Boys collected in the Almora and other North-Western hill districts.

Cerceris instabilis Sm.

Cerceris instabilis Sm. Cat. Hym. B. M. IV, p. 452, 1856. ♀.

Cerceris velox Sm. Trans. Ent. Soc. London, p. 41, 1875, ♂.

♀. Ferruginea; vertice mesothoraceque nigris; clypeo, fronte, scapo, vertice linea curvata, pronoto, scutello, postscutello, segmento mediano utrinque, segmento dorsali secundo basi, tertio quintoque totis flavis; alis hyalinis, apice valde infuscatis; clypeo apice emarginato angulis dentatis; mesopleuris hand tuberculatis; segmento ventrali secundo area basali minime elevata.

♂. Niger: maculis flavis ut in femina dispositis; segmento abdominal primo, secundo, tertioque apice ferrugineis; clypeo apice late rotundato, minutissime quadridentato.

Long. ♀, 9—11mm. ♂, 8—10 mm.

♀. Clypeus broader than long, rather widely emarginate at the apex, with a broad and slightly porrect tooth on each side at the angles of the emargination. Antennæ inserted less than half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum scarcely longer than the third. Eyes parallel on the inner margins, posterior ocelli half as far again from the eyes as from each other. First abdominal segment distinctly longer than broad; second ventral segment with the raised area at the base not very distinct; pygidial area rugose, narrowed from the base, about half as broad again at the base as at the apex. Closely, but not deeply, punctured; the enclosed area at the base of the median segment longitudinally striated.

♂. Clypeus nearly as broad as long, very broadly rounded at the apex and armed with four minute teeth. First abdominal segment nearly twice as long as broad; the area at the base of the second ventral segment more strongly raised than in the female. More deeply punctured than in the female, the enclosed area at the base of the median segment punctured and more or less longitudinally striated. Pygidial area a little longer than broad, the sides almost parallel.

Habitat.—Burma, Ceylon, and the whole of India, except the extreme North-west.

Apparently not as common in the hills as on the plains, but I have taken it at 6,000 ft. in the Khasi Hills. The colour is very variable.

Cerceris bifasciata Guér.

Cerceris bifasciata Guér. Cuv. Iconog. Regn. Anim. Insectes, p. 443, 1829-1844, Pl. 71. fig. 9.

I cannot identify the species; the figure is a tolerable representation of *C. fortinata* Cam., but does not agree with the description, which seems to point to a variety of *C. instabilis* Sm. "Entièrement fauve, ponctué, avec le devant de la tête, au-dessous de l'insertion des antennes, le premier article de celles-ci, la base des mandibules et les troisième et cinquième anneaux de l'abdomen jaunes. Ailes un peu teintées de jaunâtre avec une petite tache brune au bout.

L. 5 mil. *Hab.* le Bengale."

The length given on the plate is 10 mm.

On the whole I think there can be little doubt that the name should apply to *C. instabilis* Sm., over which it has priority.

Cerceris abuensis sp. n.

♀. Nigra; mandibulis basi, clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, segmento dorsali secundo basi, tertio fascia apicali late emarginata, quinto macula apicali, segmento ventrali tertio utrinque, tibiis tarsisque albidis; segmento abdominali primo, segmento ventrali secundo, femoribusque ferrugineis; flagello subtus fusco-ferrugineo; clypeo subconvexo, margine apicali late truncato, dentibus duobus medianis armato; mesopleuris haud tuberculatis; segmento mediano area basali oblique striata; segmento ventrali secundo area basali elevata; alis hyalinis, apice infumatis.

♂. Feminae similis; segmento dorsali quinto immaculato, segmento sexto fascia late flavida; clypeo latitudine longiore, apice subtruncato; segmento ventrali secundo area basali minime elevata; segmento ventrali sexto utrinque dente armato.

Long. ♀, 8 mm.; ♂, 9 mm.

♀. Clypeus much broader than long, coarsely punctured, broadly truncate at the apex, with a narrow and shallow incision in the middle of the apical margin, the angles of the incision produced into short, blunt teeth. Antennæ inserted nearly half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum about half as long again as the third. Eyes parallel; posterior ocelli a little further from the eyes than from each other. Pronotum not depressed in the middle; mesopleuræ without tubercles; first abdominal segment as long as broad, narrowed at the apex; second ventral segment with a rather feebly raised basal area; pygidial area small, twice as broad at the base as at the apex, gradually narrowed, less than twice as long as the breadth at the base. Closely and deeply, but not very coarsely punctured; the enclosed area at the base of the median segment coarsely obliquely striated on the basal half, indistinctly striated at the apex, the median groove indistinct.

♂. Clypeus longer than broad convex; the apical margin almost

transverse, narrowly depressed, with four raised carinæ on the depressed margin simulating teeth. Apical joint of the flagellum shorter than the penultimate, slightly curved. First abdominal segment about twice as long as broad; the raised area at the base of the second ventral segment not clearly defined. Sixth ventral segment with a short acute spine on each side at the apical angles. Pygidial area coarsely punctured, narrowed at the base, truncate at the apex, half as long again as the greatest breadth. The striæ on the enclosed area at the base of the median segment are longitudinal and very coarse.

Habitat.—Mount Abu (*Nurse*).

In colour this resembles *C. albopicta* Sm.

Cerceris belli sp. n.

♀. Nigra; segmento primo abdominali rufo-ferrugineo; flagello subtestaceo; clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, segmento secundo dorsali macula basali et apice late utrinque, segmento tertio fascia late interrupta, quarto macula utrinque, quinto fascia late emarginata pedibusque flavis; alis hyalinis, apice infuscatis; clypeo apice porrecto, late angulariter inciso; mesopleuris haud tuberculatis; segmento mediano area basali nitida, sparse punctata; segmento ventrali secundo area basali minime elevata.

Long. 7 mm.

♀. Clypeus convex, porrect at the apex, the margin widely triangularly incised, the angles of the incision slightly produced and almost forming teeth. Antennæ inserted nearly half as far again from the anterior ocellus as from the base of the clypeus; the second joint of the flagellum less than half as long again as the third. Eyes almost parallel; posterior ocelli a little further from the eyes than from each other. Pronotum, not depressed in the middle, rounded at the angles; mesopleuræ without tubercles. First abdominal segment a little broader than long; second ventral segment with a very indistinct raised area at the base. Pygidial area closely punctured, nearly twice as long as broad, truncate at the apex, the sides parallel. Closely and rather coarsely punctured; the enclosed area at the base of the median segment shining, with a few large punctures. First recurrent nervure received just beyond one-quarter from the base of the second cubital cell.

Habitat.—Belgaum, W. India (*Bell*). July.

Cerceris pulchra Cam.

Cerceris pulchra Cam. Mem. Manch. Lit. and Phil. Soc. (4) III, p. 253, 1890. ♀ ♂.

♀. Nigra; flagello, segmentisque abdominalibus primo secundoque ferrugineis; clypeo, fronte, pronoto utrinque, tegulis, postscutello, segmento dorsali secundo macula basali, tertio basi nigro maculato, quinto, pedibusque

flavis; alis hyalinis, apice infuscatis; clypeo lamina subporrecta, apicali, emarginata, sub lamina angulariter inciso; mesopleuris haud tuberculatis; segmento mediano area basali punctata; segmento ventrali secundo area basali elevata.

♂. Feminae similis; segmento dorsali secundo nigro; clypeo apice rotundato; pilis flavis ciliato.

Long. ♂ ♀, 7 mm.

♀. Clypeus flattened, the lamina slightly porrect at the apex, shallowly and very widely emarginate, the apical margin below the lamina deeply incised. Antennæ inserted about one-quarter further from the anterior ocellus than from the base of the clypeus; the second and third joints of the flagellum of equal length. Eyes parallel; posterior ocelli further from the eyes than from each other. First abdominal segment longer than broad, second ventral segment with a raised area at the base; pygidial area narrow, two-and-a-half times as long as the greatest breadth, slightly narrowed to the apex. Closely and rather deeply punctured, most coarsely on the thorax; the enclosed space at the base of the median segment punctured.

♂. Clypeus rounded at the apex and fringed with yellow hairs; first abdominal segment a little longer than in the female, more than half as long again as broad, pygidial area small, a little longer than broad.

Habitat.—Bengal; Barrackpore, Nuddea (*Rothney*).

I doubt if Bingham's records of this species from Western and North-Western India are correct.

Cerceris opulenta sp. n.

♀. Nigra; mandibulis basi, clypeo, fronte, scapo, pronoto, tegulis scutello, postscutello, segmento abdominali secundo dimidio basali, tertio quintoque totis, pedibusque flavis; segmento primo rufo-ferrugineo; flagello fusco-ferrugineo; alis hyalinis, apica infuscatis, venis fuscis; clypeo lato, apice leviter porrecto, subemarginato; mesopleuris haud tuberculatis; segmento mediano area basali subnitida, in angulis striata; segmento ventrali secundo area basali elevata.

Long. 8 mm.

♀. Clypeus twice as broad at the apex as long, the apical margin widely and shallowly emarginate and slightly porrect. Antennæ inserted about half as far again from the anterior ocellus as from the base of the clypeus; the second and third joints of the flagellum almost equal in length. Eyes parallel, the posterior ocelli almost as far from each other as from the eyes. Pronotum not depressed in the middle; mesopleuræ without tubercles. First abdominal segment distinctly longer than broad; second ventral segment with a raised area at the base. Pygidial area gradually narrowed from the base, punctured, narrowly truncate at the

apex, more than three times as broad at the base as at the apex, about half as long again as the greatest breadth. Closely but not very coarsely punctured; the enclosed area at the base of the median segment smooth, obliquely striated in the corners, with very short striæ on the sides and a deep median groove. First recurrent nervure received just before one-third from the base of the second cubital cell.

Habitat.—Shadipali, Sindh (*Comber*).

In addition to colour differences this species may be distinguished from *C. tristis* Cam. by the much broader pygidial area, and from *C. pulchra* Cam. by the shallower and less angular emargination of the clypeus.

Cerceris tristis Cam.

Cerceris tristis Cam. Mem. Manchester Lit. Phil. Soc. (4) III, p. 255, 1890. ♀ ♂.

♀. Nigra; segmentis abdominalibus primo secundoque ferrugineis; flagello subtus testaceo; clypeo, fronte, scapo, pronoto utrinque, tegulis, postscutello, segmento dorsali secundo macula basali, tertio macula basali nigra, quinto, tibiis tarsisque pallide flavis; alis hyalinis, apice leviter infuscatis, venis fuscis; clypeo subconvexo, apice late emarginato; mesopleuris haud tuberculatis; segmento mediano area basali nitida, sparse punctata; segmento ventrali secundo area basali elevata.

♂. Feminae similis; clypeo apice anguste truncato; segmento quinto secundoque apice nigris; sexto flavo.

Long. ♀, 7 mm.; ♂, 6 mm.

♀. Clypeus much broader than long, widely and rather shallowly emarginate. Antennæ inserted nearly half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum very slightly longer than the third. Eyes parallel; posterior ocelli further from the eyes than from each other. Pronotum not depressed in the middle, rounded at the anterior angles; mesopleuræ without tubercles. First abdominal segment a little longer than broad; second ventral segment with a raised area at the base; pygidial area elongate ovate, a little more than twice as long as the greatest breadth. Closely, but not coarsely punctured; the enclosed area at the base of the median segment shining, with a few large punctures, the median groove deep. First recurrent nervure received just before one-third from the base of the second cubital cell. Wings iridescent.

♂. Clypeus as long as broad, narrowed towards the apex, the margin rather narrowly truncate. Apical joint of the flagellum shorter than the penultimate, scarcely curved. First abdominal segment much longer than broad.

Habitat.—Quetta (*Nurse*). July. Deesa (*Nurse*). April. Ceylon (*Wickwar*). Barrackpore (*Rothney*).

Very near *rubida* Jur., but is much less coarsely punctured. It may be distinguished from *pulchra* Cam. by the less distinct raised area on the second ventral segment, and by the truncate apex of the clypeus of the male. Bingham's record of *pulchra* from N. W. Provinces may perhaps apply to this species. The typical form of *tristis* is without the ferruginous colour on the two basal abdominal segments, but the variety I have described here is the usual form. It seems to be one of the commonest Indian species, and has been confused in Rothney's collection with *C. pulchra*, which has the incision of the clypeus more angular, and is a somewhat larger species.

Cerceris melaina sp. n.

♀. Nigra; clypeo fascia, scapo macula, pronoto macula utrinque, segmento abdominali secundo macula parva basali, tertio fascia apicali pallide flavis; segmento primo rufo: pedibus flavovariegatis; clypeo lato, apice lamina libera truncata, segmento mediano area basali rugose striata, segmento ventrali secundo area basali elevata.

Long. 8 mm.

Clypeus slightly porrect, sparsely punctured, nearly twice as broad at the apex as long, the lamina free at the apex and broadly truncate. Inner margins of the eyes parallel, the breadth of the cheeks equal to rather more than half of the greatest breadth of the eyes. Antennæ inserted more than half as far again from the anterior ocellus as from the base of the clypeus, the second and third joints of the flagellum of about equal length, the interantennal carina short, conical between the antennæ and continued much lowered to the base of the clypeus. Ocelli in a very broad triangle, the posterior pair less than half as far again from the eyes as from each other. The whole insect closely and rather deeply punctured; the triangular area at the base of the median segment coarsely obliquely rugose striate. Pronotum short, not depressed in the middle: mesopleuræ without spines. First abdominal segment broader in the middle than long, constricted at the apex; second ventral segment with a raised area at the base. Fifth ventral segment normal; pygidial area pyriform, twice as long as the greatest breadth, much narrowed from the middle posteriorly and very narrowly truncate at the apex. First recurrent nervure received at one-third from the base of the second cubital cell.

Black; a triangular spot on the inner margin of the eyes, a transverse band on the middle of the clypeus, the scape beneath, a small spot on each side of the pronotum, a spot on the tegulæ, a small spot at the base of the second dorsal segment of the abdomen, a narrow band at the apex of the third, a small spot at the apex of the fifth, and a large spot on each side of the third ventral segment pale yellow; the legs black.

irregularly variegated with yellow and ferruginous; first abdominal segment and second ventral segment ferruginous red. Wings hyaline, with a small fuscous cloud at the apex, nervures fuscous.

Habitat.—Nasik, W. India. (*Comber*).

This is very near *C. vischnu* Cam., the shape of the pygidial area and the sculpture being very similar, but the clypeus is truncate, not incised, and the petiole is ferruginous. The latter distinction is of little importance, but I consider the shape of the clypeus quite sufficient for specific distinction.

Cerceris vischnu Cam.

Cerceris vischnu Cam. Mem. Manchester Lit. Phil. Soc. (4) III., p. 254, 1890. ♀ ♂.

Cerceris dolosa Nurse Ann. and Mag. Nat. History (7) XI., p. 525, 1903.

♀. Nigra; Mandibulis basi, clypeo in medio, margine interiore oculorum late, scapo subtus, segmentis tertio quintoque fascia angusta apicali, segmento ventrali tertio fere toto, tibiis subtus tarsisque pallide flavis, flagello subtus, coxis, trochanteribus, femoribus, segmentoque ventrali secundo ferrugineis, alis hyalinis, apice leviter infumatis, clypeo lamina apicali libera, apice incisa; segmento mediano area basali longitudinaliter striata; segmento ventrali secundo area basali elevata.

♂. Feminae similis; clypeo apice rotundato, haud inciso.

Long. ♀ 8 mm., ♂ 7 mm.

♀. Clypeus as long as broad, the lamina free at the apex and shallowly incised. Antennae inserted about half as far again from the anterior ocellus as from the base of the clypeus, the second joint of the flagellum less than half as long again as the third. Posterior ocelli almost as far from each other as from the eyes, the inner margins of the eyes parallel. Mesopleurae without tubercles; first abdominal segment nearly as long as broad; second ventral segment with a raised area at the base; pygidial area narrow, broadest at the base, gradually narrowed to the apical margin, which is very narrowly truncate, fully twice as long as the greatest breadth. Coarsely and closely punctured, the enclosed area at the base of the median segment coarsely longitudinally striated. First recurrent nervure received close to the middle of the second cubital cell.

♂. The clypeus is without the free lamina at the apex broadly rounded on the apical margin, with two minute teeth in the middle; first abdominal segment much longer than broad; pygidial area nearly square.

Habitat.—Abu (*Nurse*). Kangra Valley, 4,500 ft. (*Dudgeon*). Oddichundan, N. Ceylon (*Wickwar*).

The type is not marked in Rothney's collection and I doubt if Bingham's description is taken from a female of this species. There is no mention of ferruginous on the basal and second abdominal segments in Cameron's description, which agrees well with *dolosa*. The male referred by Cameron

to this species, and marked *ferrens* by Smith in Rothney's collection, is undoubtedly *dolosa*, and I have no doubt that Cameron's description of the female is correct, and Bingham's erroneous.

Cerceris funerea Costa var. *pallidopieta* Rad.

Cerceris pallidopieta Rad. Fedtsch. Turkestan Sphegid, p. 59, 1877. ♀.

Cerceris funerea var *pallidopieta* Ed. André Spec. Hym. Eur. III., p. 272., 1889.

♀. Nigra; mandibulis, clypeo, fronte, pronoto, tegulis, postscutello, segmento dorsali secundo macula apicali nigra, tertio macula basali nigra, quinto macula parva utrinque, pedibusque pallide flavis; flagello, femoribus segmentisque ventralibus primo secundoque testaceis; clypeo dimidio apicali depresso, apice late truncata; mesopleuris haud tuberculatis: segmento mediano area basali nitida; segmento ventrali secundo area basali elevata; segmento ventrali quinto late emarginata, angulis apicalibus dentato.

Long. 12 mm.

♀. Middle lobe of the clypeus a little longer than broad, the apical half flattened, broadly truncate at the apex. Antennæ inserted a little nearer to the base of the clypeus than to the anterior ocellus, second joint of the flagellum nearly half as long again as the third; the frontal carina short and low, separated by its own length from the base of the clypeus. Eyes slightly diverging towards the clypeus; posterior ocelli nearly as far from each other as from the eyes. First abdominal segment almost quadrate; pygidial area elongate ovate, twice as long as the greatest breadth, narrower at the apex than at the base. Closely and rather coarsely punctured; the enclosed area at the base of the median segment smooth and shining, with a median groove. Wings hyaline, with a very faint fuscous cloud at the apex.

Habitat.—Quetta (*Nurse*). June.

A single female in Colonel Nurse's collection corresponds well with the brief description and excellent figure given by Radoszkowski. The species is easily distinguished by the stout spines at the apical angles of the fifth ventral segment. The typical form of *funerea* is from S. E. Europe.

Two Fabrician species, which I have been unable to identify, doubtless belong to *Cerceris*, and are probably identical with subsequently described species; but I have not been able to consult the types, which are at Copenhagen. These are:

1. *Philanthus interstinctus* Fabr.

Philanthus interstinctus Fabr. Ent. Syst. Suppl., p. 269, 1798.

2. *Philanthus dissectus* Fabr.

Philanthus dissectus Fabr. Ent. Syst. Suppl., p. 269, 1798.

NOTES ON SOME ASIATIC SPECIES NOT OCCURRING
WITHIN THE BOUNDARIES OF INDIA.

Cerceris pedetes Kohl.

Cerceris pedetes Kohl. Zool. Jahrb. II, p. 449, 1887. ♀.

Cerceris bicornuta Sm. Cat. Hym. B. M. IV, p. 455, 1856. ♀. (nec Guérin).

Cerceris smithii D. T. Wien entom. Zeitg. IX, p. 199, 1890.

C. bicornuta Sm. is the eastern representative of *C. ferreri*, and I think is undoubtedly identical with *C. pedetes*.

Habitat.—N. China (*Smith*); Korea (*Kohl*).

Cerceris lama sp. n.

♀. Nigra; capite longe nigro hirsuto; clypei lamina, margine interiore oculorum late, macula parva pone oculos, pronoto, tegulis, postscutello, segmentisque dorsalibus 1—5 fascia late apicali emarginata lacteis; alis subhyalinis, margine costali infumato, venis nigris; clypeo lamina libera, porrecta, apice truncata; mesopleuris bituberculatis: segmento mediano area basali nitida; abdomine nitido impunctato; segmento ventrali secundo area basali elevata nulla.

Long. 14 mm.

♀. Mandibles with a strong tooth on the inner margin nearer to the base than to the apex. Clypeus rather short with a prominent lamina from the base, the lamina longer than broad, slightly arched, and truncate at the apex; the apical margin of the clypeus below the lamina deeply semicircularly emarginate. Antennæ inserted low down, almost touching the base of the clypeus; the second joint of the flagellum as long as the first and third combined, the carina between the antennæ rather low. Posterior ocelli nearly twice as far from the eyes as from each other; the eyes diverging towards the clypeus; cheeks very broad, nearly half as broad again as the eyes. Mesopleuræ bituberculate, the posterior tubercle, the largest; first abdominal segment nearly twice as broad as long; the segments scarcely constricted, second ventral segment without a raised area at the base; pygidial area with parallel sides, subtruncate at the apex and about two and a half times as long as broad, the surface rugulose at the base. Head and thorax sparsely punctured; closely punctured rugulose on the front; mesopleuræ and median segment closely punctured; the enclosed area at the base of the median segment smooth and shining, with the usual median groove; abdomen smooth and shining. First recurrent nervure received at about one-quarter from the base of the second cubital cell; second close to the base of the third cubital cell.

Habitat.—Gyangtse, Tibet, 13,000 ft., June 1904 (*H. J. Walton*).

Described from twelve specimens in the British Museum.

The colour of the markings is of the lacteous white characteristic of the district.

Cerceris ariadne sp. n.

♀. Nigra; mandibulis basi, femoribus apice, tibiis tarsisque rufo-testaceo: clypeo linea transversa, margine anteriore oculorum anguste, tegulis postscutello, segmentis dorsalibus 1-4 fascia transversa apicali flavis; alis hyalinis, apice leviter infuscatis, venis fuscis; clypeo lamina libera, porrecta, apice late emarginata, mesopleuris haud tuberculatis; segmento mediano area basali nitida; segmento ventrali secundo area basali elevata nulla.

Long. 10 mm.

♀. Clypeus with the lamina porrect from the base, broader than long, widely and shallowly emarginate at the apex, the clypeus below the lamina concave, shining and truncate at the apex. Antennæ inserted low down, close to the base of the clypeus; second joint of the flagellum about half as long again as the third. Eyes almost parallel; posterior ocelli about one-quarter further from the eyes than from each other. Pronotum not depressed in the middle, mesopleuræ not tuberculate. First abdominal segment much broader than long; second ventral segment without a raised area at the base; pygidial area nearly three times as long as the greatest breadth, the sides nearly parallel from the base to beyond the middle, then rather sharply narrowed and very narrowly rounded at the apex. Shining, rather sparsely and not very deeply punctured; the enclosed space at the base of the median segment smooth and shining, with a median groove. Pubescence on the head and sides of the thorax rather long and greyish. The apical yellow bands on segments one and four are narrowly interrupted in the middle. Wings hyaline, clouded with pale fuscous on the costa; first recurrent nervure received at one-third from the base of the second cubital cell.

Habitat.—Gyangtse, Tibet, 13,000 ft. (*H. J. Walton*); June.

Allied to *C. interrupta* Panz., but in the present species the lamina of the clypeus is free at the base and the enclosed area of the median segment is smooth.

Cerceris shelfordi sp. n.

♀. Nigra; mandibulis basi, clypeo, margine interiore oculorum latissime, carina frontali, scapo subtus, macula pone oculos, vertice maculis duabus obliquis, pronoto macula utrinque, tegulis, mesopleuris macula scutello fascia transversa, postscutello, segmento mediano fascia lata curvata utrinque, segmento dorsali primo apice, secundo fascia angusta apicali maculisque duabus basalibus, segmentis 3-5 fascia angusta apicali, 2-5 lateribus late et ventralibus utrinque flavis, oculis divergentibus; clypeo,

apice lamina libera, obtuse bidentata; mesopleuris spina magna armatis; segmento mediano area basali oblique striata; segmento ventrali secundo area basali elevata nulla; pedibus flavis.

Long. 10 mm.

♀. Head very large and broad: middle lobe of the clypeus short broader than long, the lamina free at the apex and truncate, armed with two blunt teeth; lateral lobes of the clypeus very broad, with a small tooth close to the inner margin. Antennæ inserted a little further from the anterior ocellus than from the base of the clypeus, the second joint of the flagellum a little less than half as long again as the third. Eyes strongly diverging towards the clypeus; posterior ocelli nearly twice as far from the eyes as from each other; the cheeks a little broader than the greatest breadth of the eyes. Pronotum not depressed in the middle; mesopleuræ swollen and armed with a long, acute spine. First abdominal segment nearly twice as broad as long; second ventral segment without a raised area at the base; the segments not strongly constricted; fifth ventral segment widely emarginate at the apex; pygidial area about twice as broad at the base as at the apex, gradually narrowed, twice as long as the greatest breadth. Head and thorax closely but not deeply punctured; the enclosed area at the base of the median segment coarsely obliquely striated, mesopleuræ very coarsely striated; abdomen subopaque, microscopically punctured. Wings subhyaline, the apex and the radial cell fuscous; nervures fuscous; first recurrent nervure received beyond one-third from the base of the second cubital cell.

Habitat.—Kuching, N. W. Borneo (*Shelford*); October.

Type in Oxford University Museum.

Nearly allied to *C. ferox* Sm., but differs in the form of the clypeus, the greater development of the spine on the mesopleuræ and the much shorter petiole.

Cerceris ferox Sm.

Cerceris ferox Sm. Cat. Hym. B. M. IV, p. 454, 1856. ♀. Bingham. Fascic. Malay. Zool. I, App. p. v, 1903 ♀.

Cerceris annandalei Bingham. Fascic. Malay. Zool. I, App. p. v., 1903. ♂.

Habitat.—Sumatra; Biserat, Siamese Malaya.

I am not aware that this species occurs within the boundaries of British India; the specimen from Tenasserim in the British Museum marked by Bingham as a variety of *ferox* is quite distinct.

The species closely allied to *C. ferox* may be recognized by the following key

1. Clypeus with the lamina broadly rounded at the apex and slightly porrect; petiole longer than broad *C. ferox* Sm.

Sumatra and Selangor.

Clypeus with the lamina incised or bidentate
at the apex ; petiole broader than long .. 2

2. Lamina of clypeus porrect at apex and
incised *C. ferocior* Turn.
Sarawak.

Lamina of clypeus not porrect, truncate, with
two strong median teeth *C. shelfordi* Turn.
Sarawak.

Cerceris ferocior, sp. n.

♀. *C. shelfordio* colore affinisissima ; clypeo lamina apicali libera,
porrecta, apice emarginata ; mesopleuris tuberculatis, spina minuta armatis ;
segmento mediano area cordata basi oblique, apice transverse striata ;
segmento abdominali primo latitudine fere aequilongo.

Long. 13 mm.

♀. Head very broad, twice as broad as the thorax ; clypeus with the
lamina free from a little before the apex, porrect and deeply and widely
incised at the apex. Outer lobes of the clypeus very broad, with a tooth
at the inner apical angle. Antennæ inserted about one-quarter further
from the anterior ocellus than from the base of the clypeus ; the second
joint of the flagellum nearly half as long again as the third. Eyes diverg-
ing strongly towards the clypeus ; the posterior ocelli more than twice as
far from the eyes as from each other. Cheeks as broad as the greatest
width of the eyes. Mesopleuræ swollen, with a minute spine. First abdo-
minal segment nearly as long as broad, second ventral segment without a
raised area at the base ; pygidial area about half as broad at the apex as
at the base, gradually narrowed, a little more than twice as long as the
greatest breadth. Head closely but not coarsely punctured, the front
between the ocelli and the base of the antennæ longitudinally striate-
rugulose ; thorax very sparsely punctured, the anterior half of the mesono-
tum longitudinally striated, mesopleuræ and median segment more deeply
and closely punctured ; the enclosed area at the base of the median segment
obliquely striated at the base, transversely at the apex, the median groove
indistinct. Petiole sparsely punctured ; the remainder of the abdomen
smooth ; the segments not strongly constricted.

The yellow bands on the vertex are longitudinal, not oblique,
the spot behind the eye is large and curved and the band on the
scutellum is interrupted. Wings hyaline, broadly fuscous on the costal
margin.

Habitat.—Kuching, N. W. Borneo (*Shelford*). September. Type in
Oxford University Museum.

This is nearer to *ferox* than *shelfordi*, but may be distinguished by the
shape of the lamina of the clypeus, which is broadly rounded at the apex

in *ferax* but deeply incised in *ferocior*. The petiole is also much longer in *ferax*, and the striation of the cordate area of the median segment is longitudinal. The markings in the three species are almost identical.

Cerceris invita sp. n.

♀. Nigra, opaca; clypeo, mandibulis basi, margine interiore oculorum, carina frontali, pronoto utrinque, tegulis, postscutello, segmentoque abdominali secundo basi anguste flavis; scapo, flagello subtus, segmento abdominali primo, pedibusque testaceis; alis hyalinis, apice infumatis, venis testaceis; clypeo apice emarginato, angulis dentato; mesopleuris minute bituberculatis; segmento mediano area basali delicatissime oblique striata, segmento ventrali secundo area basali elevata nulla.

Long. 1.3 mm.

♀. Clypeus flat, short, rather widely emarginate at the apex, the angles of the emargination produced into broad and slightly porrect teeth. Antennæ inserted nearly twice as far from the anterior ocellus as from the base of the clypeus; the second joint of the flagellum half as long again as the third; the frontal carina produced into a small tubercle at the apex. Eyes diverging towards the clypeus; posterior ocelli twice as far from the eyes as from each other. Pronotum not depressed in the middle; mesopleuræ with two minute tubercles. First abdominal segment nearly twice as broad as long; second ventral segment without a raised area at the base; pygidial area finely transversely rugulose, about two and a half times as long as the breadth at the base, gradually narrowed from the base and almost pointed at the apex. Opaque, pubescent, shallowly punctured; the enclosed area at the base of the median segment finely striated, obliquely in the angles, more indistinctly in the middle, intermixed with fine punctures, with a low median carina instead of the usual groove. First recurrent nervure received just before the middle of the second cubital cell.

Habitat.—Sumatra. Type in Oxford University Museum, ex coll. Westwood.

The clypeus resembles that of *C. instabilis* Sm.

Cerceris excavata Cam.

Cerceris excavata Cam. Journ. Straits Asiatic Soc., p. 135, 1902. ♂.

This is the representative of *C. vischnu* Cam. in Borneo.

The male only differs from *vischnu* in having the petiole a little shorter and broader, and in the much less distinctly raised basal area of the second ventral segment. The female has no raised area at the base of the second ventral segment, there is a yellow spot at the base of the second dorsal segment and the wings are strongly shaded with fuscous on the costal margin.



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Catherine A. M. Pearce.

MONOGRAPH OF THE WASPS OF BRITISH INDIA.

EXPLANATION OF PLATE C.

49. <i>Cerceris fortinuta</i> , Cam. ♀.	Front of head.
50. <i>Cerceris compta</i> , Turn. ♀.	„ „
51. <i>Cerceris instabilis</i> , Sm. ♀.	„ „
52. <i>Cerceris elizabethæ</i> , Bingham. ♀.	„ „
53. <i>Cerceris mustogaster</i> , Sm. ♀.	„ „
54. <i>Cerceris vischnu</i> , Cam. ♀.	„ „
55. <i>Cerceris ferow</i> , Sm. ♀.	„ „
56. <i>Cerceris violaceipennis</i> , Cam. ♀.	„ „
57. <i>Cerceris comberi</i> , Turn. ♀.	„ „
58. <i>Cerceris fastidiosa</i> , Turn. ♀.	„ „
59. <i>Cerceris melaina</i> , Turn. ♀.	„ „
60. <i>Cerceris tristis</i> , Cam. ♀.	„ „
61. <i>Cerceris ferocior</i> , Turn. ♀.	„ „
62. <i>Cerceris circumcincta</i> , Turn. ♀.	„ „
63. <i>Cerceris nursei</i> , Turn. ♀.	„ „
64. „ „ „ ♂.	„ „
65. <i>Cerceris invita</i> , Turn. ♀.	„ „
66. <i>Cerceris novara</i> , Sauss. ♀.	„ „
67. <i>Cerceris rhyncophora</i> , Turn. ♀.	„ „
68. <i>Cerceris hilaris</i> , Sm. ♂.	„ „
69. <i>Cerceris baluchistanensis</i> , Cam. ♀.	„ „
70. <i>Cerceris boysi</i> , Turn. ♀.	„ „
71. <i>Cerceris shelfordi</i> , Turn. ♀.	„ „
72. <i>Cerceris inexorabilis</i> , Turn. ♀.	Side of head.

MONOGRAPH OF THE WASPS OF BRITISH INDIA.

EXPLANATION OF PLATE D.

73. <i>Cerceris fortinata</i> , Cam. ♀.	Pygidial area.
74. <i>Cerceris compta</i> , Turn. ♀.	" "
75. <i>Cerceris instabilis</i> , Sm. ♀.	" "
76. <i>Cerceris elizabethae</i> , Bingh. ♀.	" "
77. <i>Cerceris mastogaster</i> , Sm. ♀.	" "
78. <i>Cerceris vischnu</i> , Cam. ♀.	" "
79. <i>Cerceris ferox</i> , Sm. ♀.	" "
80. <i>Cerceris violaceipennis</i> , Cam. ♀.	" "
81. <i>Cerceris comberi</i> , Turn. ♀.	" "
82. <i>Cerceris fastidiosa</i> , Turn. ♀.	" "
83. <i>Cerceris melaina</i> , Turn. ♀.	" "
84. <i>Cerceris tristis</i> , Cam. ♀.	" "
85. <i>Cerceris ferocior</i> , Turn. ♀.	" "
86. <i>Cerceris circumcincta</i> , Turn. ♀.	" "
87. <i>Cerceris nursei</i> , Turn. ♀.	" "
88. " " " ♂.	" "
89. <i>Cerceris invita</i> , Turn. ♀.	" "
90. <i>Cerceris novaræ</i> , Sauss. ♀.	" "
91. <i>Cerceris rhyncophora</i> , Turn. ♀.	" "
92. <i>Cerceris hilaris</i> , Sm. ♂.	" "
93. <i>Cerceris baluchistanensis</i> , Cam. ♀.	" "
94. <i>Cerceris boysi</i> , Turn. ♀.	" "
95. <i>Cerceris shelfordi</i> , Turn. ♀.	" "
96. <i>Cerceris mastogaster</i> , Sm. ♀.	Ventral surface of abdomen.



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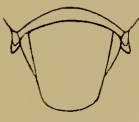
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Catherine A. M. Pearce.

Cerceris maculata Rad.

Cerceris maculata Rad. Fedtsch: Reise Turkestan, p. 57, Pl. viii, fig. 2, 1877. ♀.

♀. Central lobe of the clypeus more than half as broad again as long, convex, truncate at the apex, with two small spines near the middle of the apical margin. Second joint of the flagellum distinctly longer than the third. Front broad, the eyes diverging slightly towards the clypeus, the cheeks less than half as broad as the eyes. Pronotum very slightly depressed in the middle, rounded at the angles; mesopleuræ without spines. First abdominal segment broadest in the middle, a little broader than long; second ventral segment without a raised area at the base; pygidial area elongate pyriform, very narrowly truncate at the apex. Coarsely punctured; the triangular area at the base of the median segment shining, coarsely longitudinally striated at the base, the median groove transversely striated, the sides very delicately punctured. First recurrent nervure received before one-third from the base of the second cubital cell.

Habitat.—Basuft, S. W. Persia (*Escalera*).

BOMBAY NATURAL HISTORY SOCIETY'S
MAMMAL SURVEY OF INDIA.

REPORT BY R. C. WROUGHTON, F.Z.S.

COLLECTION	...	... No. 2.
LOCALITY	...	... Berars.
DATE	...	... May-June, 1911.
COLLECTED BY	...	... Mr. C. A. Crump.
EARLIER REPORT	...	... No. 1, E. Khandesh, Vol. XXI, p. 392 (1912).

This collection was made in the northern part of the Berars, commonly known as the Melghat. The country is hilly, and, for the most part, well wooded, the forest being composed of teak mixed with bamboos, and with sundry other trees commonly found associated with it, many of which are evergreen. The subsoil is the Dekhan trap rock, and the crops raised are for the most part those used for local consumption, such as 'nagli' and 'bajri.' The climate too is very much the same as that of the Dekhan. Some of the specimens were taken at Ellichpur and represent the Fauna of the broad valley known as the Payanghat, forming the large bulk of the Berars. Here we find great alluvial black soil plains producing cotton and jowari, whose only tree growth is patches of babhul.

The collection is a small one, comprising 69 specimens belonging to 22 species in 17 genera.

For the most part the species are the same as those contained in the Khandesh collection. Most of those that have been added to the earlier list represent the Fauna of a more jungly country, *e.g.*, the Flying Squirrel, the Wild Dog, the Palm Squirrel, the Barking Deer, and the Four-horned Antelope.

PRESBYTIS ENTELLUS, Dufr.

The common Langur.

(For synonymy, see Report No. 1.)

♂ 164. Chikalda, Berars.

♀ 187, 192. Sembadoh, Berars.

(*Vide* also Report No. 1.)

These specimens appear quite like those from Khandesh.

Note.—In the notice of *Presbytis entellus* in Report No. 1 by inadvertence the name *leucopus* has been used, it should have been *hypoleucos*.

PTEROPUS GIGANTEUS, Bruenn.

The common Flying-Fox.

1782. *Vespertilio gigantea*, Bruennich. Dyrènes Historie I., p. 45.

1825. *Pteropus medius*, Temminck. Mon. Mamm. I., p. 176.

1870. *Pteropus kelaarti*, Gray. Cat. Monk. &c., p. 104.

1891. *Pteropus medius*, Blanford. Mammalia No. 134.

♂ 197, 199, 202, 208, 211. Pili Sipna Valley, Berars.

Dr. Knud Andersen, who has studied this group, in the preparation of a Catalogue of the Chiroptera, has pointed out to me that the name *giganteus* is nearly 50 years older than *medius*, and must be used for the common Flying-Fox of the plains; he is further of the opinion that the name *leucocephalus*, Hodgs. (with its synonym *assamensis*, McClell.) must be reserved for the Himalayan Flying-Fox. I have therefore omitted them from the synonymy of *giganteus*. The names *giganteus* and *medius* were both based on specimens from Bengal. The Ceylon Flying-Fox apparently differs in no way from that of the peninsula, and *kelaarti* is consequently retained in my synonymy above. Blanford quotes *edwardsi*, Is. Geoffroy, in his synonymy, but the use of this name by Is. Geoffroy was not original, for E. Geoffroy had already given the name, in 1810, to an outwardly somewhat similar, but perfectly distinct, species from Madagascar. The name must be dropped from the synonymy of the Indian Flying-Fox.

PIPISTRELLUS CEYLONICUS, Kel.

Kelaart's Pipistrelle.

(For synonymy, see Report No. 1.)

♂ 182. (in al.). ♀ 165 (in al.) . . . Chikalda, Berars.

(*Vide* also Report No. 1.)

PIPISTRELLUS DORMERI, Dobs.

Dormer's Pipistrelle.

(For synonymy, see Report No. 1.)

♂ 158. Chikalda, Berars.

(*Vide* also Report No. 1.)

PIPISTRELLUS MIMUS, Wrought.

The Southern dwarf Pipistrelle.

(For synonymy, see Report No. 1.)

♀ 166. (in al.) . . . Chikalda, Berars.

(*Vide* also Report No. 1.)

TAPHOZOUS MELANOPOGON, Temm.

The black-bearded sheath-tailed Bat.

(For synonymy, see Report No. 1.)

♂ 168, 169. ♀ 170, 171. Chikalda, Berars.

(*Vide* also Report No. 1.)

MUNGOS MUNGO, Gmel.

The common Indian Mongoose.

(For synonymy, see Report No. 1.)

♂ 156. ♀ 157. Ellichpur, Berars.

(*Vide* also Report No. 1.)

CUON DUKHUNENSIS, Sykes.

The Indian Wild-Dog.

1831. *Canis dukhunensis*, Sykes. P. Z. S., p. 100.

1833. *Canis primævus*, Hodgson. As. Res. XVIII, p. 221.

1863. *Cuon grayiformis*, Hodgson. Catalogue, 2nd Ed., p. 5.

1888. *Cyon dukhunensis*, Blanford. Mammalia No. 70.

♂ 185. Sembadoh, Berars.

♂ 220, 221. Pili Sipna Valley, Berars.

PETAURISTA ORAL, Tick.

The Central Indian Flying Squirrel.

1842. *Pteromys oral*, Tickell. Calc. Journ. N. H. II, p. 401.

1891. *Pteromys oral*, Blanford. Mammalia No. 227 (partim.)

♀ 194. Sembadoh, Berars.

♂ 218; ♀ 223. Pili Sipna Valley, Berars.

I published recently in this Journal (Vol. XX, p. 1012) a paper on the Oriental Flying Squirrels. I there felt obliged to merge the name *oral* in the synonymy of *philippensis*. The present specimens show that it is necessary to revive the former name. The proportions of these specimens are almost exactly those recorded by Tickell in the original description of his Singhboon specimen, and are markedly smaller than that of any other known species south of the Ganges. Otherwise these specimens do not quite agree with the description of *oral*. It seems to me best, however, to list it provisionally as *oral* until we have a topotype with which to compare it.

FUNAMBULUS PALMARUM, L.

The Palm Squirrel.

1766. *Sciurus palmarum*, Linnæus. Syst. Nat., p. 86.

1814. *Sciurus penicillatus*, Leach. Zool. Misc. I, p. 6.

1832. *Funambulus indicus*, Lesson. Ill. Zool. pl. xliii.

1891. *Sciurus palmarum*, Blanford. Mammalia No. 253 (partim).

♂ 159, 174. Chikalda, Berars.

♂ 225, ♀ 210, 224. Sipna Valley, Berars.

Here, as in the Surat District, where I originally took *pennanti*, that species occurs with *palmarum*.

FUNAMBULUS PENNANTI, Wrought.

The common five-striped Squirrel.

(For synonymy, see Report No. 1.)

♀ 191. Sembadoh, Berars.

♀ 216. Sipna Valley, Berars.

(*Vide* also Report No. 1.)

TATERA INDICA, Hardw.

The Indian Gerbil.

(For synonymy, see Report No. 1.)

♂ 179. Chikalda, Berars.

(*Vide* also Report No. 1.)

VANDELEURIA OLERACEA, Benn.

The Dekhan Tree-Mouse.

1832. *Mus oleraceus*, Bennett. P. Z. S., p. 121.

1859. *Mus badius*, Blyth. J. A. S. B., XXVIII, p. 295.

1867. *Mus nilagiricus*, Jerdon. Mamm. Ind., p. 203.

1891. *Vandeleuria oleracea*, Blanford. Mammalia No. 270.

♂ 163. Chikalda, Berars.

The species was based by Bennett on a specimen collected by Col. Sykes in the Dekhan. The names *dumecola*, *dumeticola*, and *povensis*, Hodgson, represent the Nepal form (*dumecola* was not described and *povensis*, a later name, was probably a young specimen); *Vandeleuria dumeticola* must therefore stand for the northern form (dark but bright tawny) which undoubtedly is distinct from *oleracea*. Of *badius* from Tenasserim and *nilagiricus* of the Nilgiris, no specimens are available for examination, and I therefore leave those names provisionally in the synonymy of *oleracea*.

EPIMYS RUFESCENS, Gray.

The common Indian Rat.

(For synonymy, see Report No. 1.)

♂ 176, 178, 184. Chikalda, Berars.

♂ 203, 204, 209. Sipna Valley, Berars.

♂ 230; ♀ 231. Harisel, Berars.

(*Vide* also Report No. 1.)

A very even series, quite like the specimens from Khandesh.

EPIMYS BLANFORDI, THOS.

*The white-tailed Rat.*1881. *Mus blanfordi*, Thomas: A. N. N. H. (5) VII, p. 24.1891. *Mus blanfordi*, Blanford: Mammalia No. 278.

♂ 195; ♀ 189. Sembadoh, Berars.

♂ 217; ♀ 198, 212, 213, 227. Sipna Valley, Berars.

The species was based on a somewhat immature ♀, in spirit, from Cud-dapah, Madras Presidency. A little later Mr. Thomas received a second spirit specimen, a full grown ♂, also collected by Col. Beddome, and published revised measurements (P. Z. S. 1881, p. 541). Since then our Society has received specimens collected by Mr. Woosnam at Matheran, and Mr. Kinnear at Karwar, and Sai, Kolaba District, and the British Museum has a series collected by Col. Ward at Mandla. C. P. These last appear to be rather larger than any of the rest, otherwise all appear to agree together fairly well.

LEGGADA PLATYTHRIX, Benn.

The Dekhan Spiny-Mouse.

(For synonymy, see Report No. 1.)

♀ 172, 177, 180. Chikalda, Berars.

♂ 200 215; ♀ 205, 214. Pili Sipna Valley, Berars.

(Vide also Report No. 1.)

The British Museum has a spirit specimen collected by Col. Sykes, and two skin specimens collected by the Rev. Mr. Fairbank at Ahmednagar. The present series, though not altogether agreeing with these typical specimens, is so near them that, for the present, at any rate, it must rank as *platythrix*.

LEGGADA BOODUGA, Gray.

The Southern Field-Mouse.

(For synonymy, see Report No. 1.)

♂ 206, 207; ♀ 201. Pili Sipna Valley, Berars.

♂ 228. Kolkaz Sipna Valley, Berars.

(Vide also Report No. 1.)

I am not satisfied that these are true *booduga*, but the material of the latter species is so incomplete that I provisionally list them under that name.

GOLUNDA ELLIOTI, Gray.

The Indian Bush-Rat.

(For synonymy, see Report No. 1.)

♂ 183. Chikalda, Berars.

(Vide also Report No. 1.)

LEPUS SIMCOXI, Wrought.

The Khandesh Hare.

(For synonymy, see Report No. 1.)

♂ 160, 173; ♀ 167. Chikalda, Berars.

(Vide also Report No. 1.)

MUNTIACUS VAGINALIS, Bodd.

*The Barking Deer.*1785. *Cervus vaginalis*, Boddaert. Elench. Anim. I., p. 136.1816. *Cervus subcornutus*, de Blainville. Bull. Soc. Phil., p. 77.1827. *Cervus aureus*, Hamilton Smith. Griffith's An. Kingd. IV., p. 1481829. *Cervus ratna*, Hodgson. As. Res. XVIII., pt. 2, p. 139.1839. *Cervus melas*, Ogilby. Royle's Bot. Himal., p. LXIII.1844. *Cervus stylocerus*, Wagner. Schreb: Säug. Supp. IV., p. 392.1844. *Cervus albipes*, Wagner, l. c., p. 394.1872. *Cervulus tamulicus*, Gray. Cat. Rum. Mamm., p. 94.1891. *Cervulus muntjac*, Blanford. Mammalia No. 362.1904. *Cervulus grandicornis*, Lyddeker. Field. CIV., p. 780.

♀ 188. Chikalda, Berars.

♀ 193, 196. Sembadoh, Berars.

♂ 222. Pili Sipna Valley, Berars.

Zimmermann's *muntjak* (1780), Blainville's *moschatus* (1816), Gray's *curcostylis* (1872) and Kohlbrugge's *pleiharicus* (1896) were based on Javan, Sumatran, Siamese, and Bornean forms respectively, and must be excluded from the synonymy of the Indian species. The oldest name given to the continental species is *vaginalis*. The names *subcornutus* and *aureus* were based on animals of unknown habitat, but *ratna*, *melas*, *albipes*, *tamulicus*, and *grandicornis* are names available should any of the forms from the following localities prove to be separable from the Bengal 'Kakar', viz.:—Nepal, W. Himalaya, Poona Ghats, Southern India (S. M. Country) and Tenasserim.

TETRACEROS QUADRICORNIS, Blainv.

*The four-horned Antelope.*1816. *Antelope (Cervicapara) quadricornis*, Blainville, Bull. Soc. Phil., p. 78.1825. *Antelope chickara*, Hardwicke. Trans. L. S. XIV., p. 520.1839. *Antelope subquadricornutus*, Elliot. Madr. Journ. L. & S. X., p. 225.1847. *Tetraceros iodes*, Hodgson. Calc. Journ. N. H. VIII., p. 90.1847. *Tetraceros paccerois*, Hodgson. l. c.1891. *Tetraceros quadricornis*, Blanford. Mammalia No. 256.

♂ 186. ♀ 190. Sembadoh, Berars.

COLLECTION	...	... No. 3.
LOCALITY ...	...	... Cutch.
DATE ...	...	... July-August.
COLLECTED BY	...	... Mr. C. A. Crump.
EARLIER REPORTS	...	... No. 1. E. Khandesh.

Vol. XXI, p. 392 (1912).

No. 2, Berars,

Vol. XXI, p. 820 (1912).

This Collection was made in the Cutch State, which lies on the Tropic of Cancer, between 68° and 71° East longitude, on the West Coast, from which it is separated by the two Runns (Great and Little). The subsoil of Cutch is composed of stratified rocks of various ages and is covered with recent or subrecent deposits, both wind and water borne, of which the principal are sand and alluvium. Rainfall is very light, intervals of years without rain being known, the fall at Bhuj is said to average about 12 inches. The area collected over is for the most part an alluvial plain, bounded northward and westward by ranges of hills rising in some cases to an altitude of 2,000 feet. Except for some scanty bush growth on these hills, a few large trees in Bhuj and Anjar, and patches of babhul jungle scattered about, for the most part near Tanks (notably an area near the large Tank at Charwa), the whole country is treeless.

In addition to information from the Gazetteer, which I have used in the above description, Mr. Crump furnishes the following detailed descriptions :—

“Bhuj lies in a saucer and its surroundings appear to me to be as varied as can be found in Cutch State. To the W. and N., beyond 10 miles of undulating country, are ranges of mountains. There is an old Fort which harbours many Bats, situated on an isolated hill immediately overlooking the City. Just outside the City walls is a garden, kept up by the State, which is crowded with flourishing trees and shrubs, together with a profusion of flowers.”

“Rhoda Motha lies about 10 miles to the North of Bhuj, immediately beyond it limestone and trap hills rise suddenly from a plain of fine sand. Babhul and Pricklypear grow in small patches.”

“Nokania, about 3 miles from Rhoda Motha, has very varied surroundings. A large Tank, with a good patch of Babhul and Pricklypear jungle, affords good cover, the rest of the surrounding country is sandy plain, dotted with bushes, and in one direction a wide area of cultivated land.”

“Dhonsa is mainly surrounded by cultivation, it has a low range of limestone hills on one side, where some rodents were obtained, but from the rest the results were small.”

“Charwa, on the Bhuj side, has rolling hills covered with dense babhul jungle. A fine Tank, 4 or 5 miles round, has been formed by the erection of a bund. Here the trees are larger and the undergrowth thick, affording excellent cover for Leopards (which have been introduced), Pigs, Jackals, etc. Below the Tank is a well stocked garden, and beyond that for some miles jungle growth, confined to a good wide Nullah. The rest of the country is a sandy plain with low rocky hills rising from it. Towards the Bunnee is a large amphitheatre of hills in the midst of which is some good cultivation, surrounded by fair grazing grounds for sheep and cattle. It is here and along the North Coast that Wolves are common.”

“Pirwadi is near and very like Dhonsa. The wells have dried up and it is now deserted.”

“Anjar is a large town, containing some fine trees. It is surrounded by a flat stretch of cultivated land, which even extended to Kharirobar on the Coast.”

“Shikarpur is on the South Coast, eastward from Kharirobar, it is in the midst of cultivation which extends to Markhed and Nanda.”

“Poungbe is separated from Nanda by a salt plain, which is covered with water during the monsoon. It is a low plateau with a large central depression, which after the monsoon is covered with long grass giving excellent grazing to cattle, Wild Asses, Pigs and Blackbuck. Apart from grass there is absolutely no cover.”

“Padampur has good cultivation around it, and a fairly thick scrub jungle on undulating and broken ground. Close by is a group of low hills rising out of fine sand.”

“Chitrod is surrounded by an undulating plain, quite bare of trees and mostly under cultivation. On the road to Jhangi the country is still flatter, and almost entirely under cultivation.”

C. A. C.

This is a large and most interesting collection. There are 355 specimens divided among 38 species in 28 genera. As was to be expected, from the geographical position of Cutch, the collection is representative of a somewhat different fauna from those of Khandesh and the Berars.

Out of the 38 species 10 are distinctly Northern forms, *viz.*, the two Hedgehogs, the Desert Cat, the Desert Gerbil, the two ashly Spiny Mice, the Northern Field Mouse, the Cutch Rock Rat, the Sind Hare and the Rajputana Porcupine. The Mongoose is a transition form, some of the specimens show distinct signs of the red colouring which characterises *sanguinea*, Blanford, from Sind, while others are quite typical *mungo*. The majority of the species however apparently represent forms equally at home both in the north and the south. Exactly to what extent this is so it remains for further collections to decide.

The majority of these “Southern” forms have already been obtained by the “Mammal Survey” in Khandesh and the Berars, but a few are new to the list, *e.g.*, the bicoloured leaf-nosed Bat and the mouse-tailed Bats, the Caracal, the Civet, the Wolf, the Ratel, and the Pangolin.

Topotypes of the Cutch sheath-tailed Bat have now been obtained; until Mr. Crump collected this Bat at Ajanta, Hyderabad State, it had not I believe been taken since Stoliczka’s visit to Cutch about 1870.

Five forms are new to science:—The fine mouse-tailed Bat, whose nearest relative is found in Sumatra, which I have named after Mr. Kinnear, our hardworking Curator. The interesting long-tailed Rat for which I have had to provide a new Genus, as well as a new Species. I have named it *Cremnomys cutchicus*. The Generic name is best translated “Rock Rat” while the Specific name is given in honour of H. H. the Rao of Cutch, to whose goodwill we owe this collection and under whose immediate patronage it was made. The two mice, *viz.*, the smaller ashly Spiny

Mouse and the northern Field Mouse, and finally the Rajputana Porcupine.

Mr. Crump has collected and recorded a number of observations in connection with the specimens, from which I have prepared short notes and incorporated them in the report over Mr. Crump's initials.

H. H. the Rao has furnished a list of Cutchee names which have also been recorded.

PTEROPUS GIGANTEUS, Bruenn.

The common Flying-Fox.

(For synonymy, see Report No. 2.)

♂ 349. Charwa, Cutch.

♂ 407, 409; ♀ 406, 408. Bhuj, Cutch.

(*I*de also Report No. 2.)

Vernacular name—WADWAGHAN. (*H. H. the Rao.*)

[“Extremely local. There is a colony at Bhuj which roosts in the City, repairing for food to H. H. the Rao's Garden, some even wandering to Charwa, 10 miles away. It is said they are also to be found at Anjar, where there are some large trees.”—C. A. C.]

HIPPOSIDEROS FULVUS, Gray.

The bicoloured leaf-nosed Bat.

1838. *Hipposideros fulvus*, Gray. Mag. Zool. Bot. II., p. 492.

1838. *Hipposideros murinus*, Gray. 1. c.

1839. *Rhinolophus murinus*, Elliot. Madr. Journ. L. & S. X., p. 99.

1839. *Rhinolophus fulgens*, Elliot. 1. c.

1848. *Hipposideros ater*, Templeton. J. A. S. B. XVII., p. 252.

1852. *Hipposideros atratus*, Kelaart. Prod. Faun. Zeyl., p. 16.

1853. *Hipposideros cineraceus*, Blyth. J. A. S. B. XXII., p. 410.

1891. *Hipposiderus bicolor*, Blanford. Mammalia No. 166.

♂ 435, ♀ 421, 439, 446, 447. Bhuj, Cutch.

Temminck's *bicolor* was named from Java, it is a distinct species with smaller ears. I took some specimens near Darjeeling in 1891. The name must be removed from the synonymy of the present bat. Gray named two species, *fulvus* and *murinus*, on specimens sent to him by Elliot, from the Southern Mahratha Country; they were colour phases of one species, a thing not uncommon amongst the *Rhinolophidæ*. A year later Elliot described, presumably the same two forms, under the names *murinus* and *fulgens*. The names *ater*, Templeton, and its modification *atratus*, Kelaart, represent the Ceylon form of the present species and must remain in its synonymy until we have material to show that it is separable. Blyth described *cineraceus* from Pind Dadan Khan in the Punjab, he states that it is larger than

'*murinus*, Elliot' but quotes for it a markedly shorter forearm, without topotypes for comparison I must leave the name in the synonymy of *fulvus*

Vernacular name—CHAMDA. (*H. H. the Rao.*)

[“ These specimens formed the whole colony of one cave. They hung from the roof by their hind legs and did not cling or crawl on the wall.”—C.A.C.]

SCOTOPHILUS KUHLI, Leach.

The common yellow Bat.

(For synonymy, see Report No. 1.)

♀ 309, 312, 327 (in al.) . . . Bhuj, Cutch.

(*Vide* also Report No. 1.)

These specimens are undoubtedly *kuhli* though a trifle smaller and somewhat differently coloured from those received from Khandesh.

Vernacular name—CHAMDA. (*H. H. the Rao.*)

PIPISTRELLUS CEYLONICUS, Kel.

Kelaarts Pipistrelle.

(For synonymy, see Report No. 1.)

♂ 452. Bhuj, Cutch.

♀ 383 (in al.) Charwa, Cutch.

(*Vide* also Report No. 1.)

It is a pity only one specimen was obtained ; had there been a series I should have had no hesitation in separating this as a distinct local race, so different is this one from more southern specimens.

Vernacular name—CHAMDA. (*H. H. the Rao.*)

PIPISTRELLUS DORMERI, Dobs.

Dormer's Bat.

(For synonymy, see Report No. 1.)

♂ 316 (in al.) 530 (imm.), 561 (imm.), ♀ 320, 329, 343 (in al.)

555. Bhuj, Cutch.

(*Vide* also Report Nos. 1 and 2.)

Vernacular name—CHAMDA. (*H. H. the Rao.*)

TAPHOZOUS MELANOPOGON, Temm.

The black-bearded sheath-tailed Bat.

(For synonymy, see Report No. 1.)

♂ 300 (in al.), 425 (in al.), 454 (albino), 466, 467, 468, 469, 470, 471, 526, 527, 535, 545, 558, 559, 569, 570, 571, 572, 575, 576, 577, 578, 580, 581, 582, 583, 584, 585, 586, 589, 591, 592, 594, 595, 596.

♀ 422, 423, 424, 426 (in al.), 428, 429, 430, 431 (in al.), 432, 433, 440, 472, 473, 560, 573, 574, 587, 590, 593, Bhuj. Cutch.

(*Vide* also Reports Nos. 1 and 2.)

This is a very even series and differs somewhat in colour from the Khandesh specimens, which latter quite resemble some specimens, in the National Collection, from Bombay. (Kennery Caves.)

Vernacular name—CHAMDA. (*H. H. the Rao.*)

[“These were taken from a small Tomb. They cling to the wall and crawl about with great ease, their flight is rapid.”—C. A. C.]

TAPHOZOUS KACHHENSIS, Dobs.

The Cutch sheath-tailed Bat.

(For synonymy, see Report No. 1.)

♂ 541, 546, 551; ♀ 532, 533, 534, 540, 547, 548, 549, 550, 552, 553 (in al.), 554 (in al.), 588. Bhuj; Cutch.

(*Vide* also Report No. 1.)

These specimens are topotypes of Dobson's *kachhensis*, they do not appear to differ in any way from those obtained at Ajanta.

[“These bats were found in a tomb, both sexes together, no other species with them; all were full grown but some were undoubtedly of this season. They cling rather than hang and can crawl backwards up a wall with fair speed, using thumbs as well as feet. They are very noisy, especially in the evening just before emerging into the open.”]

“I several times observed this species searching round bushes for food, it hovers over the bush and actually settles for a fraction of a second, while picking an insect from among the foliage, immediately afterwards, as it flies over-head a distinct clicking sound can be heard as if a beetle or some other hard substance were being chewed.”—C. A. C.]

RHINOPOMA HARDWICKII, Gray.

The lesser Indian mouse-tailed Bat.

1831. *Rhinopoma hardwickii*, Gray. Zool. Misc., p. 37.

1891. *Rhinopoma microphyllum*, Blanford. Mammalia No. 223 (*partim*).

♂ 323, 525, 564; ♀ 455, 456, 465, 528, 529, 557.

RHINOPOMA KINNEARI, Wrought.

The greater Indian mouse-tailed Bat.

1891. *Rhinopoma microphyllum*, Blanford. Mammalia No. 223. (*partim*.)

1912. *Rhinopoma kinneari*, Wroughton. Journ. B.N.H.S., Vol. XXI p. 767.

♂ 457, 458, 459, 460 (in al.), 463 (in al.), 464 (in al.), 475 (in al.), 476 (in al.), 478, 479, 579. Bhuj, Cutch.

[“These long-tailed bats are common near Bhuj, they are high but not rapid fliers.”—C. A. C.]

NYCTINOMUS TRAGATUS, Dobs.

Dobson's wrinkled-lipped Bat.

1874. *Nyctinomus tragatus*, Dobson. J. A. S. B. XLIII., 2., p. 143.

1891. *Nyctinomus tragatus*, Blanford. Mammalia No. 224.

♂ 536, 538; ♀ 453, 537, 539, 542, 543, 544. Bhuj, Cutch.

The type, a spirit specimen in the Indian Museum, is said to have been taken at Calcutta. The National Collection has only 3 specimens, from known localities so far apart as the Punjab and the Malabar Coast.

Vernacular name—CHAMDA. (*H. H. the Rao.*)

["These bats were found singly, or two or three together, in cracks in walls or in narrow spaces, formed by slabs of stone leaning against walls. They do not hang suspended from a roof but cling, in inverted position often quite wedged in the crevice; they make a low clicking noise when disturbed and have a quick flight."—C. A. C.]

ERINACEUS COLLARIS, Gray and Hardw.

Hardwicke's Hedgehog.

1830. *Erinaceus collaris*, Gray and Hardwicke. Ill. Ind. Zool. I, pl. 8.

1832. *Erinaceus spatangus*, Bennett. P. Z. S., p. 123.

1832. *Erinaceus grayi*, Bennett. P., Z. S., p. 124.

1839. *Erinaceus indicus*, Royle. Ill. Ind. Zool. (*nomen nudum*).

1888. *Erinaceus collaris*, Blanford. Mammalia No. 104.

♂ 240, 303, 305, 306, 346, 484; ♀ 304, 345, 347, 483, 486, 487, 565. Bhuj, Cutch.

♂ 266. Nokania, Cutch.

I dealt recently with the synonymy of this species, in this Journal (Vol. XX., p. 80), and there is nothing more to be done until a series of topotypes from the Doab is available for comparison.

Vernacular name—SEVRO, SEWRA. (*H. H. the Rao.*)

["Hedgehogs seem to be very local in their distribution. They are quite common near Bhuj, rarer in the north of the State, less so in the east, and very common again in the extreme east. The Hedgehog is entirely nocturnal. It hunts singly, keeping up a steady trot in its search for food and no doubt covering a considerable distance during a night.

When handled, they sometimes inflate and deflate themselves, making a noise like the rush of air from a pair of bellows. When face downwards and not tightly curled up they can jerk up the back: this method of defence is practised most frequently by the young. Some Hedgehogs I had in captivity fought occasionally, attacking each other's faces, and making a noise like angry kittens; two large males on one occasion fought until one was severely bitten under the ear and killed.

The local tradition says that the Jackal feeds on the Hedgehog; he turns the rolled up Hedgehog on his back and drops urine on him to make him open out. The Hedgehog is incapable of jumping even the shortest distance either up or down."—C. A. C.]



Hardwicke's Hedgehog, Erinaceus collaris. $\frac{1}{2}$ nat. size.

ERINACEUS MICROPUS, Blyth.

The Northern pale Hedgehog.

1846. *Erinaceus micropus*, Blyth. J. A. S. B. XV, p. 170.
 1872. *Erinaceus pictus*, Stoliczka. J. A. S. B. XLI (2), p. 223.
 1888. *Erinaceus pictus*, Blanford. Mammalia No. 107.
 1910. *Erinaceus micropus*, Wroughton. Journ. B.N.H.S., Vol. XX, p. 80.
 ♀ 285. Nokania, Cutch.
 ♂ 299. ♀ 298. Dhonsa, Cutch.
 ♂ 302. 344, 348, 481, 482, 567; ♀ 300, 301, 480, 566, 588.
 Bhuj, Cutch.
 ♂ 500. Makhal, Cutch.
 ♂ 502. Nanda, Cutch.

As I recently pointed out in a paper (l. c.) in this Journal, the name *micropus*, used for the southern Hedgehog, by Blanford, was based by Blyth on a specimen from Bhawalpur, and applied to the present species; the name *pictus*, given by Stoliczka to the Cutch species being sunk as a synonym, that form not being separable from the Bhawalpur Hedgehog.

Vernacular name—SEVRO, SEWRA. (*H. H. the Rao.*)



The Northern pale Hedgehog, Erinaceus micropus. ½ nat. size.

The above drawing of the Northern pale Hedgehog is hardly light enough in comparison with that of Hardwicke's Hedgehog on the preceding page.

These two hedgehogs can readily be distinguished by the difference in colour, Hardwicke's being dark and the Northern pale, as its name implies, light. Besides colour the two species are at once separated by the absence in Hardwicke's of a naked furrow in the middle of the head, which, as can be seen in the drawing, is very distinct in the Northern pale Hedgehog.

PACHYURA, sp.

Shrews.

- ♂ 331. 404, 413, 414, 415; ♀ 332, 405, 444. Bhuj, Cutch.
 ♂ 477. Bhuj, Cutch.
 ♀ 284. Nokania, Cutch.

(*Vide* also Report No. 1.)

Vernacular name—ANDHI-CHHUNCHH. (*H. H. the Rao.*)

[“Musk shrews are fairly common. Two kept in captivity showed great dexterity in catching flies on the wing, raising themselves on their hind legs, and with quick movements of the head, snapping at the flies.”—C. A. C.]

FELIS AFFINIS, Gray and Hardw.

The Jungle Cat.

(For synonymy, see Report No. I.)

♂ 264. ♀ 264. Nokania, Cutch.

♀ 326. Bhuj, Cutch.

♂ 365. 376, 387; ♀ 367. Charwa, Cutch.

♀ 523. Chitrod, Cutch.

(Vide also Report No. I.)

Vernacular name—JHANG-MENO. (*H. H. the Rao.*)

[“Common wherever there is sufficient cover. It is chiefly nocturnal.”—C. A. C.]

FELIS ORNATA, Gray and Hardw.

*The Indian Desert Cat.*1832. *Felis ornata*, Gray and Hardwicke. Ill. Ind. Zool. I, pl. 2.1837. *Felis servalina*, Jardine. Nat. Libr., II, p. 232.

♂ 241. Bhuj, Cutch.

Vernacular name—JHANG-MENO. (*H. H. the Rao.*)[“One specimen only was obtained, shot over the carcase of a fresh killed sheep. I believe it to be commoner than is supposed, judging from the number of cat-tracks found in quite open ground round burrows of the Gerbil, where *affinis* is unlikely to have gone.”—C. A. C.]

FELIS CARACAL, Guld.

*The Caracal.*1776. *Felis caracal*, Guldenstadt. Nov. Com. Pet. XX, p. 500.1888. *Felis caracal*, Blanford. Mammalia No. 42.

♂ 289. Dhonsa, Cutch.

♀ 403. Bhuj, Cutch.

Vernacular name—HAYANATRO. (*H. H. the Rao.*)

[“Reported to be fairly common in the N. and N. W. Hills.”—C. A. C.]

VIVERRICULA MALACCENSIS, Gmel.

*The small Indian Civet.*1788. *Viverra malaccensis*, Gmelin. Syst. Nat. I, p. 92.1817. *Viverra indica*, Geoffroy. Desm. Nouv. Dict. VII, p. 170.1832. *Viverra bengalensis*, Gray and Hardwicke. Ill. Ind. Zool. I, pl. 4.1832. *Viverra pallida*, Gray. P. Z. S., p. 63.1888. *Viverricula malaccensis*, Blanford. Mammalia No. 48.

♂ 297. Dhonsa, Cutch.

♀ 485. Bhuj, Cutch.

Horsfield's name *rasse* must be left out of the synonymy of this species, it belongs to the Javan species which is distinct.

These specimens might have been expected to fall into the sub-species *deserti*, Bonhote, from Rajputana, but neither in colouration nor skull characters do they resemble Bonhote's type. One of the specimens is an extraordinarily aged individual, the molars being worn entirely away, their roots only showing beyond the jaw.

Vernacular name—JABADIO. (*H. H. the Rao.*)

"This Civet is nocturnal and very shy."—C. A. C.]

MUNGOS MUNGO, Gmel.

The common Indian Mongoose.

(For synonymy see Report No. 1.)

♂ 252, 339. Bhuj, Cutch.

♂ 253, 270, 277 ; ♀ 267, 269. Nokania, Cutch.

♂ 293. Dhonsa, Cutch.

♂ 373 ; ♀ 354, 355, 392. Charwa, Cutch.

♀ 400. Perwadi, Cutch.

(*Vide* also Reports Nos. 1 & 2.)

Vernacular name—NORIYO. (*H. H. the Rao.*)

"The Mongoose is very common in Cutch, particularly in the north, rarer towards the east coast. It lives under rocks and in holes, apparently dug by itself, it is diurnal, very bold, though wary, and excessively inquisitive; it rarely goes any distance from cover. It climbs well. When trapped it screams loudly, but normally anger is shown by arching the back and a growl like a cat."

"I was told by an eye witness that a mongoose attacked a snake which was coiled round a branch near the ground, the snake kept the mongoose off for some time, until the latter retired out of sight. The snake then descended to the ground and the mongoose, with a lightning-like rush from a neighbouring bush seized it by the head."—C. A. C.]

H. H. the Rao in a note to Mr. Crump expresses the opinion—

(1) that the mongoose we get here has "a white tip to its tail, and is not the same as the one commonly met with elsewhere in India which has a distinct black tip to its tail." I think H. H. must have been thinking of *Mungos smithi*, a quite distinct and somewhat larger animal, which is the only mongoose in India with a distinct black tip to its tail. The present specimens seem to average a shade smaller than those from Khandesh and Berar, and have a very slightly more reddish colouration in the bars across the tail than is found in the latter.

2) "The Cutch mongoose is probably the same one as in Sindh." The North Sind mongoose (i. e., *ferrugineus*, Blanford) is strikingly different in its general bright rufous colouration and red tail-tip.

Some Rajputana specimens in the National Collection seem to be intermediate between *ferrugineus* and true *mungo* as represented by the present series and the specimens from Khandesh and the Berars.

HYÆNA HYÆNA, L.

The striped Hyæna.

(For synonymy, see Report No. 1.)

♂ 259, 282. Nokania, Cutch.

♂ 330; ♀ 328. Bhuj, Cutch.

(Vide also Report No. 1.)

CANIS PALLIPES, Sykes.

The Indian Wolf.

1831. *Canis pallipes*, Sykes. P. Z. S., p. 101.

1888. *Canis pallipes*, Blanford. Mammalia No. 68.

♂ 390; ♀ 391. Charwa, Cutch.

Vernacular name—BHAGAD. (*H. H. the Rao.*)

[“The Wolf is common along the North Coast of Cutch especially so in the Bunnee, where he preys on the sheep sent there to graze. I saw a pack of seven at Rhoda Motha, and another of eight near Charwa from which the two specimens were obtained. In the north of the State many sheep are killed by wolves. In the Bunnee, Wolves are said to attack Shepherds occasionally but are easily driven off with sticks. So far as I could learn, Wolves are very rare in the South of Cutch and are unknown in the East.”—C. A. C.]

CANIS INDICUS, Hodgs.

The common Indian Jackal.

1833. *Canis aureus indicus*, Hodgson. As. Res. XVIII, p. 237.

1888. *Canis aureus*, Blanford. Mammalia No. 69.

♀ 245, 248. Rhoda Motha, Cutch.

♀ 278, 286. Nokania, Cutch.

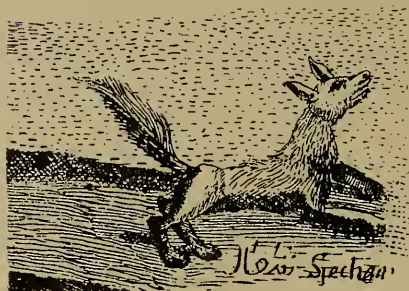
♂ 314. Bhuj, Cutch.

♂ 375; ♀ 386. Charwa, Cutch.

♀ 503. Nanda, Cutch.

(Vide also Report No. 1.)

Linnaeus in describing *aureus* writes “nitide flavus . . . Descriptio vera animalis etiamnum defecit.” He had never seen the animal either dead or alive, but based his recognition of it on an account by Kæmpfer of an animal seen by him in the Province of Lar, on the Persian Gulf. While giving a long account of its habits, &c., Kæmpfer gave no detailed description of the animal itself, he furnished however a figure of which I give an exact reproduction here.



Kaempfer's figure of the Persian Gulf Jackal (1712)
on which Linnæus based his *Canis aureus* (1756).

After trying for several years, our Society has at last succeeded in obtaining two specimens from Bunder Abbas, which it has presented to the National Collection, and which may, I think, be confidently accepted as topotypes.

Basing on these it appears that the true *aureus* of S. Persia differs considerably from the Indian Jackal. The bases of the hairs, in the former are white, while in the latter, they are yellow or some shade of brown. The face and ears (externally) of all Indian Jackals which I have seen are bright tawny, while in the Persian Gulf *aureus* the face is grizzled buff and black and the ears are pinkish-buff.

In their skulls the two forms differ but little. In the Indian form, however, the teeth between the carnassial and the canine (upper) have spaces between them, while in true *aureus* they touch one another and even to a slight extent overlap. The result of this in the living animal must be that the Indian Jackal has a longer muzzle, which is just what would have been expected by anyone familiar with dog-breeding in India.

I give here for easy reference a comparative table of some skull measurements :—

—	<i>aureus</i> , Persian Gulf.	<i>indicus</i> , Nepal.	<i>indicus</i> , Khandesh.	<i>indicus</i> , Cutch.
Condyllo-basal length ..	145	148	154	149
Basilar length	133	140	142	138
Greatest breadth	81	88	85	83
Nasals length	49	54	52	55
Palatilar length	70	74	75	72
M ² to front of canine ..	62	66	69	66

I propose to drop the name *aureus* altogether for the Indian Jackal and to adopt provisionally Hodgson's name *indicus*. I advisedly use the word provisionally, for until much more material is available we are not in a position to assume that the Jackal remains absolutely unchanged throughout all India, indeed so far as I am now able to judge such is not the case.

Vernacular name—SİYAD. (*H. H. the Rao.*)

["Jackals are extremely common all over Cutch. They are very susceptible to rabies".—C. A. C.]

VULPES BENGALENSIS, Shaw.

The common Indian Fox.

(For synonymy, see Report No. 1.)

♂ 239 ; ♀ 238. Bhuj, Cutch.

(*Vide* also Report No. 1.)

Vernacular name—LONKDO (*H. H. the Rao.*)

VULPES LEUCOPUS, Blyth.

The Indian desert Fox.

1854. *Vulpes leucopus*, Blyth. J. A. S. B., XXIII, p. 729.

♀ 268. Nokania, Cutch.

My identification of this specimen is not satisfactory, but, without more material, I have no option but to label it *V. leucopus*. I cannot agree with Blanford that *griffithi* and *pusilla* are identical with *leucopus*. If the latter name ultimately proves to be synonymous with *leucopus*, it will take its place as the name of the species, with *leucopus* as a synonym, for *pusilla* is the older.

Vernacular name—LONKDO. (*H. H. the Rao.*)

MELLIVORA INDICA, Kerr.

The Indian Ratel.

1792. *Ursus indicus*, Kerr. Anim. Kingd., p. 188.

1834. *Ursitarus inauritus*, Hodgson. As. Res. XIX, p. 61

1888. *Mellivora indica*, Blanford. Mammalia No. 89.

♂ 287. Dhonsa, Cutch.

♂ 333. Bhuj, Cutch.

Vernacular name—GHURNAR. (*H. H. the Rao.*)

FUNAMBULUS PENNANTI, Wrought.

The common five-striped Squirrel.

(For synonymy, see Report No. 1.)

♂ 262, 263 ; ♀ 258. Nokania, Cutch.

♂ 340, 341 ; ♀ 313, 402. Bhuj, Cutch.

♀ 362. Charwa, Cutch.

(*Vide* also Reports Nos. 1 and 2.)

Vernacular name—KHILODI. (*H. H. the Rao.*)

[“Plentiful in Bhuj and Charwa, not very common in other parts, rare in the East.”—C. A. C.]

MERIONES HURRIANÆ, Jerd.

The Indian desert Gerbil.

1867. *Gerbillus hurrianæ*, Jerdon. Mamm. Ind., p. 186.

1891. *Gerbillus hurrianæ*, Blanford. Mammalia No. 265.

♂ 243 ; ♀ 247, 254, 255. Rhoda Motha, Cutch.

♂ 265, 275. Nokonia, Cutch.

♂ 310, 318, 319 ; ♀ 308, 531, 556. Bhuj, Cutch.

♂ 353. Charwa, Cutch.

♀ 398. Pirwadi, Cutch.

♂ 520, 521 ; ♀ 519, 522. Chitrod, Cutch.

The names *indicus* and *erythraurus*, quoted by Blanford in the synonymy of this species, represent distinct species so that I have omitted them entirely. The present series seems to be quite typical.

Vernacular name—KHETRAU-UNDAR. (*H. H. the Rao.*)

[“The common Gerbil of Cutch, found wherever the soil is light or sandy ; it is by no means entirely nocturnal, individuals may be seen burrowing or feeding at any time of the day, but especially in the morning. It often sits upright with the forefeet suspended but, with an upward jerk of its tail, it plunges into its burrow at the least alarm. It can move about fairly rapidly ; usually keeping the body close to the ground, it moves by a series of little leaps if seriously alarmed or pursued. It seems to trust a good deal to its close coloured resemblance to its surroundings to escape detection, and, when feeding, may be approached near enough to bring its slightest movements under observation. When feeding it sits upright and conveys, with great rapidity, pieces of grass to its incessantly working jaws.

My attempts to photograph it however were not a success.

Its burrows are in groups of 2 or 3 or more together, each burrow has several entrances, all leading to a central chamber, in which, after the rains, considerable stores of seeds are probably stored. A pair of adults inhabit each burrow and appear to resent the intrusion of strangers.”—C. A. C.]

MILLARDIA MELTADA, Gray.

The soft-furred Field-Rat.

(For synonymy, see Report No. 1

♂ 242. Rhoda Notha, Cutch.

♀ 271, 272. Nokania, Cutch.

(*Vide* also Report No. 1.)

CREMNOMYS CUTCHICUS, Wroughton.

The Cutch Rock-Rat.

1912. *Cremnomys cutchicus*, Wroughton. Journ. B. N. H. S., Vol. XXI, p. 341.

- ♂ 249; ♀ 246, 250. Rhoda Motha, Cutch.
 ♂ 256, 274; ♀ 273. Nokania, Cutch.
 ♂ 288, 290, 291, 295; ♀ 292. Dhonsa, Cutch.
 ♂ 350, 356, 358, 359, 360, 369, 371, 372; ♀ 357, 378, 388.
 Charwa, Cutch.
 ♂ 394, 395; ♀ 396, 397, 399. Pirwadi, Cutch.
 ♂ 510; ♀ 509, 511, 512, 516, 517. Padampur, Cutch.

[“These long-tailed Mice are found wherever there are rocky hills, particularly among limestone. They are nocturnal, and feed on grass, seeds, and the leaves of a small bush, and live under and among the rocks; they seem to be gregarious from the fact that in places large collections of droppings may be found in hollows under rocks.”—C. A. C.]

EPIMYS RUFESCENS, Gray.

The common Indian Rat.

(For synonymy, see Report No. 1.)

- ♂ 324, 325, 336, 416, 436, 438, 451; ♀ 311, 322, 334, 335, 337,
 410, 411, 416, 417, 419, 439, 445, 474. Bhuj, Cutch.
 ♂ 504; ♀ 505. Adesar, Cutch.

(*Vide* also Reports Nos. 1 and 2.)

There appears to be no noticeable variation in the specimens so far received.

Vernacular name—GAMTI-UNDAR. (*H. H. the Rao.*)

[“Rats are very common everywhere, they keep to huts and houses and are protected and fed by the Banyas.”—C. A. C.]

MUS MUSCULUS, L.

The common House-Mouse.

- ♂ 437 (imm); ♀ 420. Bhuj, Cutch.

(*Vide* also Report No. 1.)

I must, much against the grain, still use this name though the present specimens bear little or no resemblance to true *musculus*. The names *lubius*, *homourus*, and *urbanus* of Hodgson appear to all represent a species not unlike these specimens but with such poor material it is impossible to differentiate. Good series of house mice from all over India are a great desideratum.

Vernacular name—UNDEDI. (*H. H. the Rao.*)

[“House mice are not common in Cutch, but few were taken in Bhuj. They were reported from the North but not known in the East of the State.”—C. A. C.]

LEGGADA SADHU, Wrought.

The ashy Spiny Mouse.

1911. *Leggada platythrix sadhu*. Wroughton. Journ. B. N. H. S., Vol. XX. p. 1001.,

♂ 251. Rhoda Motha, Cutch.

♂ 294; ♀ 296. Dhensa, Cutch.

♂ 351 $\frac{3}{4}$, 379, 381, 384, 389; ♀ 352, 380. Charwa, Cutch.

♂ 508, 518. Padampur, Cutch.

This fine series shows that *sadhu* can no longer be classed as a sub-species of *platythrix*. It represents indeed a separate group characterised by the partial closing in of the mesopterygoid fossa behind the posterior nares and a mammary formula of 4-2-12.

[“These spiny mice were found usually on dark, soft soil, among Babhul jungle and beneath fallen trees but always on hill sides. They are usually most plentiful near water.”—C. A. C.]

LEGGADA CINDERELLA, Wrought.

The smaller ashy Spiny Mouse.

1912. *Leggada cinderella*, Wroughton. B. N. H. S. Vol. XXI, p. 770.

♂ 257, 280; ♂ 281. Rhoda Motha, Cutch.

♂ 307, 321, 482. Bhuj, Cutch.

♂ 377; ♂ 385. Charwa, Cutch.

♂ 507. Padampur, Cutch.

The type specimen of this species is an old female, of which the measurement of the head and body is recorded as 85 mm., other fully grown specimens measure 83, 84, etc. Among the specimens of *L. sadhu* collected by Mr. Crump, this measurement is recorded as 104 mm., in one, while scarcely any, and those immature, are under 88 mm.

LEGGADA DUNNI, Wrought.

The Northern Field-Mouse.

1891. *Mus booduga*, Blanford. Mammalia No. 287. (*partim*).

1912. *Leggada dunni*, Wroughton. Journ. B. N. H. S. *supra*. p. 339.

♂ 279. Nokania, Cutch.

A series collected by Major Dunn, R.A.M.C., has been waiting some time for separation from *booduga*. I have now described it earlier in the last number (No. 2, Vol. XXI) of the Journal. The present specimen belongs to the species. It has the under parts pure white as in some of the Ambala specimens.

GOLUNDA ELLIOTI, Gray.

The Indian Bush-Rat.

(For synonymy, see Report No. 1.)

♂ 366, 382. Charwa, Cutch.

(*Vide* also Reports Nos. 1 and 2.)

LEPUS DAYANUS, Blanf.

*The Sind Hare.*1874. *Lepus dayanus*, Blanford. P. Z. S., p. 663.1884. *Lepus joongshaiensis*, Murray. Vert. Zool. Sind., p. 51.

♂ 401; ♀ 236, 237, 317. Bhuj, Cutch.

♂ 283. Nokania, Cutch.

♂ 342. Bhuj, Cutch.

♀ 361, 363, 364. Charwa, Cutch.

♂ 493; ♀ 488, 494. Anjar, Cutch.

♂ 498, 499. Makhal, Cutch.

♀ 513, 514. Padampur, Cutch.

Vernacular name—S_{AO}. (*H. H. the Rao.*)

[“Hares are very common throughout Cutch. They breed in June and July and again in September and October, having 1 or 2 young at a birth. The Shikaris assert that there are two species in Cutch, a larger and a smaller.”—C. A. C.]

HYSTRIX CUNEICEPS, Wrought.

*The Rajputana Porcupine.*1892. *Hystrix leucura*, Blanford. Mammalia. No. 315.1912. *Hystrix leucura cuneiceps*, Wroughton. Journ. B. N. S., Vol. XXI, p. 771.

♀. 244. Rhoda Motha, Cutch.

♂. 261. Nokania, Cutch.

This form which I have described on an earlier page of this Journal is easily recognisable by its smaller size and its rusty colouration compared with the black of true *leucura* and by its wedge-shaped skull.

Vernacular name—S_{ED}. (*H. H. the Rao.*)

[“In Cutch, porcupines seem to favour the shelter of rocks rather than making their own burrows. They are not known further East than Chitrod, are said to be rare to the S. E. of Bhuj, and comparatively common along the north coast, and the same round Charwa and to the West.”—C. A. C.]

GAZELLA BENNETTI, Sykes.

The Indian Gazelle.

(For synonymy, see Report No. 1.)

♂ 489, 490, 491, 496, 497; ♀ 492, 495. Anjar, Cutch.

♀ 524. Chitrod, Cutch.

(Vide also Report No. 1.)

Vernacular names—CHINKARO, RATADIO, KAR-PUCHO. (*H. H. the Rao.*)

MANIS CRASSICAUDATA, G. St. Hil.

The Indian Pangolin.

1803. *Manis crassicaudata*, G. St. Hilaire. Cat. Mamm., p. 213.

1834. *Manis indicus*, Lesson. Suite. Mamm., IV., p. 520.

1842. *Manis (Phatagis) laticauda*, Sundevall. Vet. Ak. Handl., p. 258.

1872. *Pholidotus bengalensis*, Fitzinger. S. B. Ak. Wien., p. 64.

♂ 315. Bhuj, Cutch.

The name *pentadactyla* which was based on an animal from Formosa must be reserved for the Chinese Pangolin, as must *brachyura* for the same reason.

Vernacular name—CHHALO. (*H. H. the Rao.*)

COLLECTION ... No. 4.

LOCALITY ... Nimar.

DATE ... November-December.

COLLECTED BY ... Mr. C. A. Crump.

EARLIER REPORTS ... { No. 1, E. Khandesh, Vol. XXI, p. 392.
No. 2, Berars, Vol. XXI, p. 820.
No. 3, Cutch, Vol. XXI, p. 826.

Nimar, the district in which the present collection was made, is on the Satpura Plateau, about 21°-30' N. Latitude, and 76°-20' E. Longitude. The soil is the Dekhan trap. The country is much broken up into ranges of low hills. These are covered with the usual Satpura tree growth of *Boswellia* and *Hardwickia*, the intervening cultivation being mostly of Jawari. The annual rainfall is about 32 inches. The climate and topography of this district are sufficiently like those of E. Khandesh and the Berars to render it probable that it would carry much the same Fauna, and though a few species were obtained here for the first time, they were such as might, equally well, have been taken in either or both of the other localities.

The collection includes 170 specimens belonging to 27 species, in 22 genera; of these 4 are new to the list of species obtained by Mr. Crump so far, and one is new to science. Amongst the more interesting things are the two small shrews and the new mouse.

The former I have allotted to two species with considerable doubt. The *Pachyura* group of shrews, with 18 upper teeth, are found all over the plains of India and are represented by one species in

Europe, *Pachyura etrusca*, found on the Mediterranean littoral, and in Africa by *P. madagascariensis* from Madagascar, *P. leucura* from Zanzibar, and *P. gracilis* from South Africa. Curiously all these four species are pigmies, and closely related to the animal which I have here called *P. perrotteti*. I have heard it stated that the African species are constantly found in white ants' nests. I have a list of no less than 55 names already given to the representatives of the *Pachyura* group in India and until a very much larger and more representative collection of specimens is available for study, but little can be done to sort out this tangle of names.

The new mouse is most interesting. I have given a description of it on an earlier page. In its coat and some characters of the skull it closely resembles *Leggada platythrix*, its size however and dentition show it to be a true *Mus*. Unfortunately Mr. Crump only obtained one male specimen, a female specimen, showing the mammary formula, is a great desideratum; it will be most interesting to discover whether in this character this animal is allied to *L. platythrix* with its 12 mammae, or to *Mus* with only 10.

Mr. Crump seems to have had very great difficulty in trapping the smaller Rodents. He suggests that the harvest season, and the consequent abundance of food in the fields, may have been the reason. Mr. Crump also writes—"I have before observed that the Jungle Cat is by no means exclusively nocturnal, but in other places I have not seen them hunting regularly in broad daylight; and I suggest that this change of tactics on the part of these cats at Hewra is because they feed principally on birds, owing to the scarcity of rats and mice."

Mr. Crump has recorded a number of local vernacular names, but as they are, with one exception, the same as those recorded by Blanford I have not entered them. The name "Bija" given for the lesser Civet must, I think, be a mistake, for it is one very generally used for the Indian Ratel.

PRESBYTIS ENTELLUS, Dufr.

The common Langur.

(Synonymy in No. 1.)

664. Hewra, Nimar.

(See also Reports 1 and 2.)

["These Langurs, from the top of a very lofty tree can reach the ground in about four leaps or rather drops; these drops are made in quick succession, in an upright position, not, as a rule, on to heavy boughs but among the foliage. When alarmed and running through long grass they get along in great bounds, and while running, frequently raise themselves to their full height to look round. I saw young of all ages in one party—an old female was playing with her young one which she grasped by both hands, threw it in the air, and caught it again by the hands as it reached the ground.

"A dead monkey is one of the finest baits for Hyænas, Jackals and Cats."—C. A. C.]

PTEROPUS GIGANTEUS, Brunn.

The common Flying-Fox.

(Synonymy in No. 2.)

♂ 602. ♀ 603 .. Asirgarh, Nimar.

♂ 700. ♀ 697, 701 .. Siwal, Nimar.

(See Reports Nos. 2 and 3.)

CYNOPTERUS SPHINX, Vahl.

The short-nosed Fruit Bat.

1797. *Vespertilio sphinx*, Vahl. Skr. Nat. Selsk. IV., p. 123.

1797. *Vespertilio fibulatus*, Vahl. l. c., p. 124.

1803. *Pteropus pusillus*, E. Geoffroy. Cat. Mamm., p. 49.

1810. *Pteropus marginatus*, E. Geoffroy. Ann. Mus. XV., p. 97.

1870. *Cynopterus marginatus, ellioti*, Gray. Cat. Monk., &c., p. 122.

1891. *Cynopterus marginatus*, Blanford. Mammalia, No 138.

♀ 702 .. Mandva, Nimar.

Dr. K. Andersen has kindly examined this specimen; it is quite young, but there is no doubt that it is true *sphinx*.

LYRODERMA LYRA, Geoff.

The Indian Vampire Bat.

(Synonymy in No. 1.)

♂ (in al.) 609, 631, 632 .. Asirgarh, Nimar.

(Also see Report No. 1.)

TAPHOZOUS MELANOPOGON, Temm.

The black-bearded sheath-tailed Bat.

(Synonymy in No. 1.)

♂ 634, 638 (in al.), 641, 643, 652. ♀ 639 (in al.), 642, 653.

Asirgarh, Nimar.

(See also Reports Nos. 1, 2 and 3.)

TAPHOZOUS THEOBALDI, Dobs.

*Theobald's sheath-tailed Bat.*1872. *Taphozous theobaldi*, Dobson. P. A. S. B., p. 152.1891. *Taphozous theobaldi*, Blanford. Mammalia, No. 219.

♂ 635, 644, 651 Asirgarh, Nimar.

This bat was described by Dobson on a specimen from Tenasserim.
The British Museum has also a series from Java.

RHINOPOMA KINNEARI, Wrought.

The greater Indian Mouse-tailed Bat.

(Synonymy in No. 3.)

♂ 646, 649, 650, 655 (in al.). ♀ 633, 636, 637, 645, 647, 648,
656 (in al.), 657, 658 (in al.).

(See also Report No. 3.)

PACHYURA, sp.

Shrews.

♂ 711. ♀ 715, 724 Chandghar, Nimar.

♂ 731. Garoor, Nimar.

(See also Reports Nos. 1 and 3.)

PACHYURA STOLICZKANA, Anders.

*Stoliczka's Shrew.*1877. *Crocidura stoliczkana*, Andersen. J. A. S. B. XLVI., p. 270.1877. *Crocidura bidiana*, Andersen. J. A. S. B. XLVI., p. 276.1888. *Crocidura bidiana*, Blanford. Mammalia, No. 120.

♀ 677 Hewra, Nimar.

If *stoliczkana* and *bidiana* are identical, clearly the former name must
be accepted for the species. I record this identification with great
misgiving.

PACHYURA FERROTTETI, Duvern.

*The Indian pigmy Shrew.*1842. *Sorex perrotteti*, Devernoy. Mag. Zool., p. 29.1855. *Sorex melanodon*, Blyth. J. A. S. B. XXIV., p. 33 (preoccupied.)1855. *Sorex nudipes*, Blyth. l. c., p. 34.1873. *Pachyura assamensis*, Andersen. P. Z. S., p. 232.1877. *Crocidura macrotis*, Andersen. J. A. S. B. XLVI., p. 271.1877. *Crocidura nitidiflora*, Andersen. l. c., p. 272.1877. *Crocidura nilgirica*, Andersen. l. c., p. 274.1877. *Crocidura travancorensis*, Andersen. l. c., p. 275.1888. *Crocidura perrotteti*, Blanford. Mammalia, No. 125.

623. Asirgarh, Nimar.

Blanford ranks all these pigmy shrews in two species, viz., *Hodgsoni* and *perrotteti*, the former including the sub-Himalayan forms and the latter all the rest. The material at present is insufficient to justify any more exact treatment.

FELIS AFFINIS, Gray.

The Jungle Cat.

(Synonymy in No. 1.)

♀ 597, 601	.. ..	Asirgarh, Nimar.
♂ 666, 669, 670, 672.	♀ 674	.. Hewra, Nimar.
♂ 717	.. ..	.. Chandgarh, Nimar.
♂ 756	.. ..	.. Garoor, Nimar.

(See also Reports Nos. 1 and 3.)

[“*Felis affinis* was exceedingly common, and it was most noticeable that it was always on the move by day. Its movements can easily be followed by the piping of squirrels and the chirping of birds.”—C. A. C.]

MUNGOS MUNGO, Gmel.

The common Indian Mongoose.

(Synonymy in No. 1.)

♂ 659.	♀ 627	.. ..	Asirgarh, Nimar.
♂ 716	.. ..	..	Chandgarh, Nimar.
♀ 728, 734	.. ..	..	Garoor, Nimar.

(See also Reports Nos. 1, 2 and 3.)

[“The Mongoose No. 728 was living in the trunk of a tree, the entrance being a narrow slit some 3 feet from the ground.”—C. A. C.]

HYÆNA HYÆNA, L.

The striped Hyæna.

(Synonymy in No. 1.)

♂ 665.	♀ 663	Asirgarh, Nimar.
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(See also Reports Nos. 1 and 2.)

CANIS INDICUS, Hodgs.

The Jackal.

(Synonymy in No. 1 under *C. aureus*.)

738, 747	Garoor, Nimar.
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(See also Reports Nos. 1 and 3.)

CUON DUKHUNENSIS, Sykes.

The Indian Wild-Dog.

(Synonymy in No. 2.)

♂ 654.	Asirgarh, Nimar.
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(See also Report No. 2.)

FUNAMBULUS PALMARUM, L.

The Palm Squirrel.

(Synonymy in No. 2.)

♂	625	..	..	..	Asirgarh, Nimar.
♀	683	..	..	..	Asirgarh, Nimar.
♀	685, 691, 698, 699	..	..	..	Sival, Nimar.
♂	735	..	..	..	Garoor, Nimar.

(See also Report No. 2.)

FUNAMBULUS PENNANTI, Wrought.

The common five-striped Squirrel.

(Synonymy in No. 1.)

♂	626	..	..	..	Asirgarh, Nimar.
♀	667, 668, 682	..	..	..	Hewra, Nimar.
♂	720, 723, 721 (in al.)	..	..	..	Chandghar, Nimar.
♂	762, 765	..	..	..	Garoor, Nimar.

(See also Reports Nos. 1, 2 and 3.)

[“ I have been observing them (*Funambulus pennanti*) for a week and have never heard the shrill piping note so frequently uttered by the Palm Squirrels. These Squirrels have a low chirping or rather twittering note; they are exceedingly shy; they appear much redder in colour than the Palm Squirrel; the stripes are narrow and in life the coat is very glossy and lies very close.”—C. A. C.]

TATERA INDICA, Hardw.

The Indian Gerbil.

(Synonymy in No. 1.)

♂	621.	♀	610, 611, 616	..	Asirgarh, Nimar.
♂	660, 679.	♀	661, 678	..	Hewra, Nimar.
♂	689.	♀	692	..	Sival, Nimar.
♂	705.	♀	706, 714..	..	Chandgarh, Nimar.

(See also Reports Nos. 1 and 2.)

VANDELEURIA OLERACEA.

The Dekhan Tree-Mouse.

(Synonymy in No. 2.)

♂	693.	♀	694	..	Sival, Nimar,
♂	718, 725	..	..	..	Chandgarh, Nimar.

(See also Report No. 2.)

MUS PHILLIPSI, Wrought.

*Phillips' spined Mouse.*1912. *Mus phillipsi*, Wroughton. Journ. B. N. H. Soc. Vol. XXI, p. 772.

♂ 618. Asirgarh, Nimar.

This pretty little animal has, at first sight, a curiously close superficial resemblance to *Leggada platythrix*, but is really barely half the size of that species. The presence of frontal ridges on the skull add to this resemblance, but the dentition is so essentially that of *Mus* that its separation from *Leggada platythrix* cannot, for a moment, be in doubt.

Although the type was not taken in his District, I have great pleasure in naming it after Mr. R. M. Phillips, who has taken such great interest in the Field work of the Mammal Survey, and given such great assistance to our collector Mr. G. C. Shortridge.

LEGGADA PLATYTHRIX, Benn.

The Dekhan Spiny-Mouse.

(Synonymy in No. 1.)

- ♂ 612, 662 Asirgarh, Nimar.
♂ 676 Hewra, Nimar.

(See also Reports Nos. 1 and 2.)

LEGGADA BOODUGA, Gray.

The Southern Field-Mouse.

(Synonymy in No. 1.)

- ♂ 619, 622, 628 (in al.), 640. ♀ 604, 620 (in al.). Asirgarh, Nimar.
♂ 673, 675. ♀ 680 Hewra, Nimar.
♂ 688 Sival, Nimar.
♂ 703, 712, 719. ♀ 704, 713 .. Chandgarh, Nimar.
♂ 739. ♀ 736, 740, 741, 764 .. Garoor, Nimar.

(See also Reports Nos. 1 and 2.)

MILLARDIA MELTADA.

The soft-furred Field Rat.

(Synonymy in No. 1.)

- ♂ 730, 748, 758, 766. ♀ 767. Garoor, Nimar.

(See also Reports Nos. 1 and 2.)

EPIMYS RUFESCENS, Gray.

The common Indian Rat.

- ♂ 600. ♀ 598, 599 .. Asirgarh, Nimar.
♂ 681 (imm.) Hewra, Nimar.
♂ 684, 695 Sival, Nimar.
♀ 707 Chandgarh, Nimar.
♂ 726, 732, 746, 750, 753, 755. ♀ 727, 733, 739, 749, 751, 752
Chandgarh, Nimar.

(See also Reports Nos. 1, 2 and 3.)

GUNOMYS KOK, Gray.

The Southern Mole-Rat.

(Synonymy in No. 1.)

♂ 629.	♀ 605, 606, 607	.. ..	.. Asirgarh, Nimar.
♀ 671	.. ..	..	.. Hewra, Nimar.
♂ 686,	687, 690	.. ..	.. Sival, Nimar.
♂ 709.	♀ 710	.. ..	.. Chandgarh, Nimar..
♂ 744,	757, 760.	♀ 745, 754, 761	.. Garoor, Nimar.

(See also Report No. 1.)

GOLUNDA ELLIOTI, Gray.

The Indian Bush-Rat.

(Synonymy in No. 1.)

♂ 608,	614, 615, 624.	♀ 613, 617, 630	(in al.) Asirgarh.
			Nimar.
♂ 696	.. ..	.. Sival,	Nimar.
♂ 759.	♀ 763..	.. Garoor,	Nimar.

(See also Reports Nos. 1, 2 and 3.)

LEPUS SIMCOXI, Wrought.

The Khandesh Hare.

(Synonymy in Report No. 1.)

♂ 708	.. ..	.. Chandgarh,	Nimar.
♂ 729,	737, 743.	♀ 742	.. Garoor, Nimar.

(See also Reports Nos. 1 and 2.)

DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

BY

E. MEYRICK. B.A., F.R.S., F.Z.S.

XV.

(Continued from page 131 of this Volume.)

EUCOSMIDÆ.

Hermenias, n. g.

Antennæ in ♂ ciliated, with excavated notch in stalk near base. Palpi moderate, porrected, second joint with dense rough projecting scales above and beneath, terminal joint moderate. Thorax without crest. Forewings with 7 and 8 stalked, 7 to apex or termen. Hindwings with 3 and 4 stalked or coincident, 5 closely approximated at base, 6 and 7 closely approximated towards base.

Type *epidola*, Meyr. from Australia.

Hermenias pachnitis, n. sp.

♂ ♀. 14-15 mm. Head, palpi, and thorax blackish mixed with white. Antennal notch of ♂ at $\frac{1}{4}$. Forewings elongate, posteriorly slightly dilated, costa slightly arched, without fold, apex obtuse, termen slightly sinuate, rather oblique; 7 to termen; grey or dark grey ribbed with black; costa more or less obscurely strigulated with white irroration; an irregular patch of confused white marbling or strigulation occupying most of dorsal half from base to $\frac{2}{3}$ and thence extended as a fascia to costa before apex, including a more or less defined irregularly triangular spot of ground colour on middle of dorsum; a leaden-metallic whitish-edged erect mark from tornus, and a leaden-metallic streak along lower $\frac{3}{4}$ of termen: cilia grey sprinkled with whitish, basal half white with three or four blackish bars on upper half of termen. Hindwings with 3 and 4 coincident; thinly scaled, semi-transparent, dark grey; cilia dark grey, in ♂ on dorsum and tornus greatly elongated.

Maskeliya and Patipola, Ceylon (Pole, Green, Alston); in November, December, April and May, four specimens.

Hermenias implexa, n. sp.

♂ ♀. 14-16 mm. Head, palpi, and thorax rather dark fuscous, sometimes slightly whitish-sprinkled. Antennal notch of ♂ close above base. Forewings elongate, narrow, costa slightly arched, in ♂ with strong fold reaching from base to near middle, apex obtuse, termen indented-sinuate, rather oblique; 7 to termen; dark fuscous; a broad irregular streak of whitish irroration or suffusion along dorsum from base, occupying nearly half of wing, upper edge sinuate or angularly indented before middle,

dorsal edge dotted with dark fuscous, separated from ocellus by a triangular tornal spot of ground colour; ocellus margined by two thick leaden-metallic streaks confluent beneath, sometimes whitish-irrorated, containing several irregular and variable black dots or short dashes; some oblique violet-leadened strigæ from costa posteriorly, rising from short obscure whitish strigulæ: cilia fuscous, with two or three series of white points. Hindwings with 3 and 4 coincident; grey, thinly scaled, veins dark fuscous, termen suffused with dark fuscous, more broadly towards apex; cilia light fuscous, with darker subbasal shade, tips whitish-tinged, in ♂ elongated on tornus and dorsum.

Namunakuli and Patipola, Ceylon (Green): from February to May, eight specimens.

Hermenias palmicola, n. sp.

♂ ♀. 11-12 mm. Head, palpi, and thorax fuscous. Antennal notch of ♂ close above base. Forewings elongate, narrow, somewhat contracted posteriorly, costa gently arched, in ♂ with strong fold reaching from base to beyond middle, apex obtuse, termen somewhat sinuate-indentèd beneath apex, rather oblique; 7 to termen; dark fuscous; dorsal half mostly covered with suffused transverse strigæ of whitish irroration; a pale leaden-grey erect striga from tornus, and a streak along termen; some oblique obscure purplish-leadened strigæ from costa posteriorly, rising from short strigulæ of whitish irroration; between these and terminal leaden streak is a narrow patch of fine scattered whitish hairscales; a small distinct white mark on costa before apex: cilia fuscous irrorated with whitish and somewhat sprinkled with dark fuscous. Hindwings with 3 and 4 coincident; thinly scaled, semitransparent, grey; veins dark fuscous; termen suffused with dark fuscous, more broadly towards apex; cilia fuscous sprinkled with whitish, in ♂ elongated on tornus and dorsum.

Trincomali, Puttalam, and Batticaloa, Ceylon (Green, Fletcher, Pole); in May, June and October, three specimens. Very like *implexa*, but smaller, without the defined triangular dark spot before tornus, and structurally distinct by the longer costal fold; it is a low-country species, whilst *implexa* occurs at high elevations only.

Spilonota, Steph.

This generic name supersedes *Tmetocera*, Led. and *Strepsicrates*, Meyr. I have described three Indian species, *S. rhothia*, which also occurs in Mauritius, *S. calcata* and *S. melanacta*, the antennal structure in the last-named having been overlooked; and now add four more.

Spilonota meleanocopa, n. sp.

♂ ♀. 15-17 mm. Head, palpi, and thorax dark grey sprinkled with white. Antennal notch of ♂ at $\frac{1}{3}$. Forewings elongate in ♂, rather narrow, costa slightly arched, in ♂ faintly sinuate beyond middle, with broad fold extending from base to beyond middle, apex obtuse, termen

straight, somewhat oblique; dark grey, coarsely and suffusedly strigulated with white; in ♂ a blackish patch on costa beyond middle; a black longitudinal mark in middle of disc, in ♀ slight and broken; a triangular blackish præternal spot; ocellus margined by silvery-metallic streaks, and containing two or three black dots; a transverse black mark resting on middle of termen: cilia dark fuscous mixed and irrorated with whitish. Hindwings with 3 and 4 stalked; dark fuscous, thinly scaled, especially towards base, more so in ♂; cilia fuscous, towards tips whitish-sprinkled,

Khasis; in June, six specimens.

Spilonota algosa, n. sp.

♂ ♀. 12-15 mm. Head and thorax dull olive-greenish, mixed with dark fuscous or blackish. Palpi whitish-greenish, spotted or barred with blackish. Antennal notch of ♂ close above base. Forewings elongate posteriorly somewhat dilated, costa gently arched, without fold, apex obtuse, termen slightly sinuate, somewhat oblique; dull olive-green, with some iridescent-whitish scales and some scattered blackish strigulae; costa black, with pairs of whitish strigulae; basal patch strigulated with black, and with outer edge formed by a fascia of black suffusion, acutely angulated below middle; central fascia more or less irregularly suffused with black, acutely angulated in middle; two or three bluish-lead-metallic oblique strigulae from costa posteriorly; a blackish præternal spot, tending to be confluent with a blackish blotch before middle of termen, both limited posteriorly by blue-lead-metallic streaks; apex black; a fine black terminal line: cilia olive-greenish mixed or obscurely barred with blackish. Hindwings with 3 and 4 stalked; thinly scaled, grey, with violet-blue iridescence; veins dark fuscous; cilia grey.

Khasis; in August and September, fourteen specimens.

Spilonota babylonica, n. sp.

♂. 15 mm. Head and thorax white, shoulders dark grey. Palpi grey, edges sprinkled with white. Antennal notch very near base. Forewings elongate, costa gently arched, without fold, apex obtuse, termen hardly sinuate, oblique; ochreous-white, base of scales pale greyish; costa and dorsum dotted with dark fuscous; a grey patch marked with dark fuscous extending along basal fourth of costa; a semioval grey blotch on middle of costa, reaching half across wing, marked with dark fuscous and discal edge suffused with black; a grey triangular præternal spot; two or three black strigulae on termen: cilia grey mixed with dark fuscous. Hindwings with 3 and 4 stalked; thinly clothed with blackish-grey scales, membrane with strong violet-blue iridescence; cilia grey-whitish, with greyer sub-basal shade, on dorsum long.

Nilgiris, 6,000 feet (Andrewes); in May, one specimen.

Spilonota aestuosa, n. sp.

♂. 17-21 mm. Head and thorax olive-greenish marked with dark

fuscous. Palpi ochreous-whitish, second joint with apical bar and two spots dark fuscous. Antennal notch close above base. Forewings elongate, posteriorly slightly dilated, costa gently arched, with rather narrow fold extending from base to beyond middle, apex obtuse, termen sinuate, somewhat oblique; dull olive-greenish, mixed or strigulated with dark fuscous; a large blackish blotch extending along costa, from base to $\frac{3}{5}$, and reaching $\frac{3}{4}$ across wing, lower edge with a triangular emargination beneath middle of wing edged with white anteriorly, posterior edge rather oblique, with two acute projections, edged with leaden-metallic; a subtriangular black prætornal spot edged with leaden-metallic; costa posteriorly black with pairs of whitish strigulae, giving rise to two oblique leaden-metallic strigae and a blackish striga between them; a leaden-metallic streak close before termen in middle, preceded by a blotch of blackish suffusion: cilia olive-greenish, mixed with dark fuscous round apex and upper part of termen. Hindwings with 3 and 4 stalked; fuscous, veins and termen dark fuscous cilia fuscous.

Darjiling; Khasis; in May and August, two specimens.

Crusimetra, n. g.

Antennae in ♂ minutely ciliated. Palpi moderate, porrected, second joint with rough projecting scales above and beneath, terminal joint short. Thorax with small posterior crest. Forewings with 7 and 8 stalked, 7 to termen. Hindwings with 3 and 4 connate, 5 approximated at base, 6 and 7 stalked.

Crusimetra verecunda, n. sp.

♂ ♀. 13-15 mm. Head, palpi, and thorax grey or dark grey, sprinkled with whitish. Forewings elongate, costa gently arched, in ♂ without fold, apex obtuse, termen sinuate, somewhat oblique; ochreous-brown or ferruginous-brown, variably irrorated or suffused (sometimes wholly) with dark grey whitish-tipped scales, apex and terminal area usually but not always remaining brown; a more or less marked spot of blackish irroration or suffusion towards dorsum before middle: cilia blackish, with some whitish points. Hindwings ochreous-grey-whitish or whitish-grey-ochreous, suffused with grey towards apex; cilia ochreous-whitish, with two grey shades.

Namunakuli, Ceylon (Green); in February, six specimens.

Acroclita, Led.

This name supersedes *Rhopobota*, Led. I have described one species, *A. physalodes*, which occurs in Ceylon and the Chagos Islands, and now record thirteen more, one of which is a well-known European species.

Acroclita clivosa, n. sp.

♂. 13-14 mm. Head white, sides of crown tinged with ochreous-brownish. Palpi fuscous, terminal joint and apex of second white. Thorax white suffused on sides with ochreous-brown, with two posterior blackish

bars. Abdomen black at base beneath. Forewings elongate, costa gently arched, without fold, apex round-pointed, prominent, termen abruptly concave-indented beneath it, then somewhat obliquely rounded; 3 and 4 closely approximated throughout, 6 closely approximated to 7; grey suffusedly irrorated with white; costa dark fuscous, with pairs of whitish strigulæ; basal patch irregularly suffused with brown, more or less strigulated with blackish, on dorsum reaching to middle, outer edge obtusely angulated below middle; central fascia slender, ochreous-brown, not reaching dorsum, crossed in middle by a black streak extended almost to apex; some blue-leadens strigæ from costa posteriorly; ocellus enclosed by two leaden-metallic streaks: cilia grey irrorated with whitish, with dark fuscous apical patch. Hindwings with 3 and 4 stalked; pale grey-darker at apex: cilia pale grey, costal cilia thickened. Forewings on undersurface with rather broad suffused dark fuscous streak along costa from base to near apex.

Khasis; in October, two specimens.

Acroclita cheradota, n. sp.

♂ ♀. 10-11 mm. Head and thorax light ochreous. Palpi pale, ochreous, hairs beneath suffused with whitish. Forewings elongate, rather narrow, costa gently arched, in ♂ without fold, apex round-pointed, rather prominent, termen concave beneath it; light brownish-ochreous, with strong violet purple iridescence, irrorated with ferruginous-brownish except towards costa anteriorly; a blotch of irregular blackish strigulation extending on dorsum from near base to middle, and reaching more than half across wing; costa finely strigulated with blackish; an oblique suffused ferruginous-brown mark from costa beyond middle; some ferruginous-brown suffusion on costa towards apex, including a whitish strigula near apex, sometimes followed by a blackish dot, apical prominence margined beneath with whitish: cilia brownish-ochreous, beneath apex with a whitish bar. Hindwings with 3 and 4 stalked; grey, thinly scaled in disc, darker on veins and posteriorly; cilia grey.

Puttalam, Ceylon (Pole); Pusa (Lefroy); in March and April, two specimens. Larva feeding in rolled leaves of *Ficus religiosa* (Lefroy).

Acroclita grypodes, n. sp.

♂. 17 mm. Head pale ochreous, face ochreous-whitish. Palpi greyish-ochreous, terminal joint and apex of second whitish. Thorax brownish, with whitish-ochreous dorsal stripe edged with dark fuscous. Forewings elongate, costa gently arched, without fold, apex falcate-prominent, termen semicircularly excavated beneath it; ochreous-brown; costal edge dark fuscous, with fine obscure oblique strigulæ of whitish irroration; a darker brown longitudinal band from base of dorsum to apex of wing, edged above with ochreous-whitish suffusion from before middle to near apex; dorsum dotted with blackish; a streak of whitish suffusion along dorsum from base

to beyond middle, where it turns slightly upwards, edged above with a streak of dark fuscous suffusion which is continued beyond it along dorsum to beyond tornus; some ochreous-whitish irroration or suffusion posteriorly between this and median band: cilia fuscous somewhat sprinkled with ochreous-whitish, with patches of dark fuscous suffusion at apex and below middle of termen. Hindwings with 3 and 4 stalked; rather dark fuscous; cilia fuscous; on undersurface with a narrow elongate subcostal patch of blackish modified scales extending from $\frac{1}{4}$ to beyond middle.

Maskeliya, Ceylon (Pole); in May, one specimen.

Acroclita scleropa, n. sp.

♂ ♀. 15-16 mm. Head and thorax greyish more or less tinged with brown, thorax anteriorly suffused with blackish. Palpi dark fuscous. Forewings elongate, rather narrow, costa gently arched, in ♂ without fold, apex round-pointed, rather prominent, termen abruptly concave-indented beneath it; grey suffusedly irrorated with whitish; costa blackish, with pairs of fine whitish strigulae; basal patch brownish, irregularly strigulated with blackish, reaching on dorsum to middle and suffused with blackish towards dorsum posteriorly, outer edge angulated in middle; central fascia narrow, oblique, upper half blackish, lower half ochreous-brownish, posterior edge with an abrupt black projection in middle; apical area ochreous-brown, with several oblique leaden-metallic strigae from posterior half of costa, and a black elongate mark towards costa above ocellus; ocellus ochreous-brown, margined by two thick leaden-metallic streaks, and containing a black dash near lower extremity: cilia grey irrorated with whitish, with dark fuscous apical patch. Hindwings with 3 and 4 stalked; grey, veins darker; in ♂ beneath an elongate-ovate patch of blackish modified scales extending beneath costa from near base to $\frac{2}{3}$; cilia light fuscous, with darker subbasal shade.

Namunakuli, Patipola, and Maskeliya, Ceylon (Green, Pole, Alston); from January to April, five specimens.

Acroclita naevana, Hb.

Maskeliya, Ceylon (Pole); N. Coorg, 3,500 feet (Newcome); Khasis; in May, June, and from October to December, ten specimens. Occurs also throughout Europe and Central Asia to Japan. On the undersurface of both wings the colouring is darker in Indian examples than in European, so that the patch of black suffusion on the hindwings of ♂ stands out less conspicuously; otherwise I can detect no difference, and the specific identity is undoubted.

Acroclita symbolias, n. sp.

♂ ♀. 13-14 mm. Head white, sides fuscous. Palpi fuscous, terminal joint and apex of second white. Thorax brown, with pale grey central stripe. Forewings elongate, costa gently arched, apex round-pointed, prominent, termen abruptly concave-indented beneath it; pale greyish,

faintly greenish-tinged; costa strigulated with dark fuscous; rounded-quadrate dark grey spots on costa representing edge of basal patch and extremity of central fascia, between these a white patch reaching half across wing; dorsal half of basal patch suffused with brown and dark fuscous, extending to beyond middle, outer edge angulated below middle; from its angle a streak of greenish-grey and brownish suffusion runs to apex, marked with two black dashes; ocellus brownish marked in middle with black, margined with thick leaden-grey marks becoming white above; a brown mark along middle of termen: cilia dark leaden-grey irrorated with white, towards base white. Hindwings with 3 and 4 stalked; grey, darker posteriorly; cilia grey.

Khasis; in August and October, two specimens.

Acroclita belinda, n. sp.

♂ ♀. 11-13 mm. Head white. Palpi dark grey, terminal joint and apex of second white. Thorax ochreous-whitish, anterior half blackish. Forewings elongate, rather narrow, costa slightly arched, without fold, apex round-pointed, termen sinuate, rather oblique; green mixed with iridescent-white; basal $\frac{2}{3}$ suffused with blackish except a broad dorsal pale ochreous streak with upper edge triangularly prominent beyond middle and terminated by a triangular blackish præternal spot; costa posteriorly black, with four pairs of white strigulae; two or three black dashes towards apex; ocellus margined laterally with iridescent-white: cilia blackish irrorated with whitish. Hindwings with 3 and 4 connate; grey; cilia light grey, sprinkled with whitish.

Khasis; in July and August, two specimens.

Acroclita esmeralda, n. sp.

♂ ♀. 9-10 mm. Head and thorax pale emerald-green, thorax spotted with black and white. Palpi white, spotted with black. Forewings elongate, rather narrow, costa gently arched, without fold, apex obtuse, termen sinuate, somewhat oblique; pale emerald-green strigulated with black; a black subquadrate spot on costa at $\frac{1}{3}$; a large irregular-edged triangular blackish blotch extending over dorsum from $\frac{1}{4}$ to tornus and reaching to middle of costa; costal area posteriorly blackish, with four pairs of whitish strigulae giving rise to oblique leaden-metallic strigae; ocellus emerald-green, edged with silvery-whitish, and crossed by three or four black dashes; a black terminal line: cilia pale greenish, round apex with black subbasal line, above apex blackish. Hindwings with 3 and 4 long-stalked; rather dark grey, thinly scaled in disc, veins and apical suffusion darker; cilia grey, tips paler.

Khasis; in October, two specimens.

Acroclita corinthia, n. sp.

♂ ♀. 13-15 mm. Head and thorax rather dark fuscous irrorated with pale ochreous. Palpi fuscous, obscurely spotted with whitish-ochreous

suffusion. Forewings elongate, posteriorly slightly dilated, costa gently arched, without fold, apex round-pointed, termen sinuate, somewhat oblique; fuscous, irrorated with whitish or whitish-ochreous, and strigulated with blackish; costa blackish, before middle with two, and beyond it with five pairs of whitish strigulae, giving rise to more or less marked blue-leaden-metallic striæ, those from posterior half very oblique, and subcostal space between them more or less ferruginous; basal patch brownish strigulated with black, outer edge angulated below middle, little marked; central fascia slender, brown, strigulated with black, little defined; ocellus obscurely margined with blue-leaden metallic: cilia brownish sprinkled with whitish, variably marked with dark fuscous, especially at apex. Hindwings with 3 and 4 stalked; fuscous, very thinly scaled, semi-hyaline, with violet-purple reflections, in ♀ darker posteriorly; veins blackish; in ♂ on under-surface with a black patch along costa, from base to beyond middle, costal edge on this furnished with very long fine hairs; cilia grey, darker towards base.

Maskeliya, Ceylon (Pole, Green, Alston); Khasis; in May, and from October to December, five specimens. The characteristic hindwings distinguish this species.

Acroclita neaera, n. sp.

♂ ♀. 12-13 mm. Head grey-whitish. Palpi whitish, second joint mostly occupied by three dark fuscous spots. Thorax olive-greenish mixed with black and white. Forewings elongate, rather narrow, slightly dilated posteriorly, costa gently arched, without fold, apex round-pointed, termen sinuate, somewhat oblique; dull olive-green suffusedly strigulated with white; markings margined and irregularly strigulated with black; basal patch represented by blotch at base and angulated fascia beyond it: central fascia moderate, oblique, interrupted below middle; costa posteriorly blackish, with four pairs of whitish strigulae, giving rise to oblique purplish-leaden strigæ; ocellus margined laterally by purplish-leaden streaks mixed with whitish, and surmounted by a blackish spot; a black terminal line: cilia olive-greenish, outer half dark grey irrorated with whitish, round apex wholly blackish-irrorated. Hindwings with 3 and 4 stalked; dark grey, thinly scaled in disc; cilia rather dark grey. Forewings on undersurface in ♂ suffused with blackish on costal half from base to beyond middle.

Maskeliya, Ceylon (Pole); in May and June, two specimens.

Acroclita chlorissa, n. sp.

♂ ♀. 12-14 mm. Head and thorax green, shoulders suffused with blackish. Palpi green, obscurely spotted with blackish. Forewings elongate, posteriorly rather dilated, costa slightly arched, in ♂ with narrow fold extending from base to $\frac{2}{3}$, apex round-pointed, termen sinuate, somewhat oblique; green; markings obscurely edged with iridescent-whitish;

triangular spots suffusedly outlined with black at base, on costa at $\frac{1}{3}$, and on dorsum at $\frac{1}{3}$; a blackish blotch on middle of costa, reaching half across wing, adjoining which beneath is a spot outlined with black; a small blackish spot on costa beyond this; a transverse blackish blotch from costa beyond $\frac{1}{3}$, reaching more than half across wing; a triangular spot on dorsum suffusedly outlined with black, sometimes almost touching this; a small black apical spot; a black terminal line: cilia green, with blackish apical spot. Hindwings with 3 and 4 very long-stalked; grey; cilia light grey, more whitish towards tips.

Khasis; in October, three specimens.

Acroclita multiplex, n. sp.

♀. 14-16 mm. Head white. Palpi dark fuscous, terminal joint and apex of second white. Thorax white mixed with light grey, shoulders spotted with dark fuscous. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex round-pointed, termen sinuate, somewhat oblique; white, with some transverse leaden-grey marks, especially towards dorsum; costa strigulated with blackish; a dark grey basal fascia marked with black; a dark grey black-edged spot on costa at $\frac{1}{4}$; a dark grey black edged blotch on dorsum at $\frac{1}{3}$, reaching half across wing; a slender oblique dark fuscous streak from middle of costa not reaching half across wing; a dark fuscous transverse blotch from dorsum before ocellus, marked with black and a brown spot, reaching more than half across wing; ocellus broadly margined with leaden-metallic, containing four short black marks adjacent to its posterior edge, separated with brownish, and surmounted by a semicircular blackish blotch; posterior half of costa with small blackish marks terminated beneath with ferruginous, alternating with strigulae terminated with leaden-metallic; a leaden-metallic striga before apex; a black apical mark edged above with ferruginous-brown and beneath with white: cilia grey irrorated with white. Hindwings with 3 and 4 stalked; grey; cilia pale grey, with darker subbasal line.

Patipola and Ohiya, Ceylon (Pole, Green); in April and November, two specimens. Superficially extremely like *Eucosma cremnitis*, but smaller and apart from the differences in neururation, readily distinguished by the white head and apical portion of palpi.

Acroclita thysanota, n. p.

♂. 15-16 mm. Head and thorax dull olive-greenish, thorax somewhat strigulated with blackish. Palpi dull olive-greenish spotted with blackish. Abdomen with long whitish apical hairs. Forewings elongate, somewhat dilated posteriorly, costa gently arched, without fold, apex obtuse, termen straight, rather oblique; dull olive-greenish, strigulated with black except towards costa on posterior $\frac{2}{3}$; costal edge black with pairs of whitish strigulae; a black spot on costa before $\frac{1}{3}$; a very oblique transverse black spot from middle of costa; posterior area of wing crossed by irregular

lead-metallic strigæ, two of these enclosing a narrow ocellus marked with black, and preceded by a triangular blackish prætorial spot: cilia olive-greenish with some obscure dark fuscous and whitish bars, above apex blackish. Hindwings with 3 and 4 stalked; grey with prismatic-violet iridescence, thinly scaled; cilia whitish-grey, on dorsum and tornus much elongated to form a dense projecting pale ochreous hair pencil.

Khasis; in November, two specimens.

Ancylis carpalima, n. sp.

♂ ♀. 11-15 mm. Head whitish, more or less ochreous-tinged on crown. Palpi fuscous, terminal joint and long hairs of second white. Thorax brownish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex falcate, termen semi-circularly excavated beneath it; ferruginous-brownish or ferruginous-ochreous, variably mixed or obscurely streaked longitudinally with whitish; costa obliquely strigulated with blackish and whitish; dorsum dotted with dark fuscous; a more or less marked suffused whitish line along submedian fold, dorsal area within this sometimes suffused with dark brown; a more or less marked very oblique dark brown streak from middle of costa, costal area beyond this sometimes suffused with dark brown; a variably developed longitudinal patch of brown suffusion streaked with dark fuscous from middle of disc to near termen, and sometimes posterior area much suffused with dark brown; apical projection dark brown or ferruginous, edged anteriorly and beneath with white: cilia brown, variably sprinkled or largely suffused with white. Hindwings with 3 absent, tornus in ♂ rather prominent; rather dark grey, somewhat thinly scaled in disc; cilia grey or whitish-grey, round apex tinged with ochreous or fuscous.

Kandy, Ceylon (Green); N. Coorg, 3,500 feet (Newcome); Khasis; from August to November, ten specimens. Also occurs in Queensland, Australia. The markings are variable and confused; the dark brown colouring is more developed in specimens from Coorg and Ceylon than in those from the Khasis and Australia, but there is no constant difference.

Ancylis scatebrosa, n. sp.

♀. 13-14 mm. Head ochreous-whitish, forehead somewhat mixed with brownish. Palpi with long hairs, ochreous-whitish, second joint with spot of dark fuscous suffusion towards apex. Thorax ochreous-whitish marked with ferruginous-brown. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex falcate, termen concave; ochreous-whitish crossed throughout by irregularly anastomosing brownish-ochreous striæ, suffused with dark fuscous; posterior half of costa dark fuscous strigulated with white, subcostal space beneath this light ochreous, traversed by a very oblique leaden-metallic striga; a fine black terminal line: cilia light brownish-ochreous, with a blackish subbasal dot beneath apex, and more or less marked blackish subbasal shade on lower half of termen. Hindwing

with 3 and 4 stalked; rather light grey; cilia whitish-grey, with darker subbasal shade.

Khasis; in June, two specimens.

Ancylis rostrifera, n. sp.

♂. 11-12 mm. Head rather dark fuscous. Palpi dark fuscous, terminal half white. Thorax fuscous mixed with white posteriorly, shoulders marked with blackish. Forewings elongate, costa rather strongly arched anteriorly, slightly sinuate posteriorly, apex falcate, termen strongly excavated beneath it; ochreous-white, dorsal half mixed with leaden-grey; costa anteriorly marked with small scattered blackish spots; lower half of basal patch formed by four irregular transverse blackish or dark fuscous marks; posterior area from beyond middle to near termen largely suffused with ferruginous-brown, somewhat mixed with blackish and posteriorly marked with leaden-metallic, its costal edge black strigulated with white, more strongly black posteriorly; terminal area white spotted with leaden-metallic, with a black terminal line, apex ferruginous-brown; cilia ochreous whitish. Hindwings with 3 and 4 stalked; grey, thinly scaled in disc; cilia grey, tips paler.

Maskeliya, Ceylon (Pole); in October, two specimens.

Ancylis ancorata, n. sp.

♀. 12-13 mm. Head pale brownish-ochreous, forehead mixed with blackish, face mixed with blackish and margined with whitish. Palpi with long hairs, whitish, spotted with blackish suffusion. Thorax brownish-ochreous. Forewings elongate, costa gently arched, apex falcate-prominent, termen abruptly concave beneath it; ochreous-brown, suffused with whitish-ochreous towards anterior half of costa; costa strigulated with black and on posterior half with whitish; a grey slightly brownish-tinged streak, edged above by a pale or whitish-tinged line, running along dorsum from $\frac{1}{5}$ to tornus and continued to middle of termen, dilated on tornus and termen, marked with some blackish suffusion before tornus; a triangular leaden-metallic mark before termen resting on extremity of this streak; sometimes a few black scales in disc towards middle; a leaden-metallic striga from $\frac{3}{5}$ of costa to near termen beneath apex; a white strigula on costa near apex, and a leaden-metallic terminal mark beneath it; cilia whitish-ochreous, above apex ochreous-brown, beneath it with spot of whitish suffusion. Hindwings with 3 and 4 stalked; grey, darker posteriorly; cilia grey.

Kegalle, Ceylon (Alston); Konkan (Young); three specimens.

Herpystis pallidula, n. sp.

♂ ♀. 10-14 mm. Head white. Palpi white, basal half infuscated. Thorax ochreous whitish. Forewings elongate, somewhat contracted posteriorly, costa gently arched, without fold, apex obtuse, termen slightly sinuate, rather oblique; ochreous-whitish or pale whitish-ochreous, with

scattered strigulæ of dark fuscous irroration except toward base; costa obliquely strigulated throughout with black; an undefined spot of black irroration on fold indicating angle of basal patch; a narrow ochreous patch along posterior half of costa, marked with four pairs of whitish costal strigulæ and some very oblique leaden-metallic strigæ from these; ocellus obscurely margined with leaden-metallic, enclosing some scattered black scales: cilia whitish-ochreous. Hindwings pale greyish; cilia whitish-grey.

N. Coorg, 3,500 feet (Newcome); from October to December, six specimens.

Gypsonoma, Meyr.

This genus is essentially distinguished from *Eucosma* by the stalking of veins 6 and 7 of hindwings.

Gypsonoma anthracitis, n. sp.

♂ ♀. 10-11 mm. Head, palpi, and thorax in ♂ wholly dark grey, posterior extremity of thorax whitish; in ♀ head white, crown suffused with grey, dark fuscous on sides, palpi dark fuscous, with terminal joint and apex of second white, thorax dark grey mixed with white posteriorly, patagia white except shoulders. Abdomen in ♂ with long grey hairs from each side of back near base. Posterior tibiæ in ♂ clothed with rough whitish scales above. Forewings elongate, rather narrow, somewhat contracted posteriorly, costa gently arched, without fold, apex round-pointed, termen sinuate, rather strongly oblique; ochreous-white, somewhat sprinkled with grey; basal patch suffused with grey, with three or four blackish-grey striæ, outer edge very obtusely angulated below middle; central fascia and posterior area wholly suffused with grey, irregularly and sharply marked with black, costa finely strigulated with whitish, giving rise to some oblique leaden-metallic strigæ, ocellus leaden-grey edged with white: cilia whitish mixed with grey and dark fuscous (imperfect). Hindwings narrower than forewings, 3 and 4 stalked; dark grey, thinly scaled anteriorly; in ♂ a brush of long dense dark grey hairs from anterior half of costa; undersurface in ♂ with dorsal area broadly blackish, costal edge with rough projecting white scales anteriorly; cilia long, grey, in ♂ on dorsum forming an expanded rough fringe of very long hairs. Undersurface of forewings in ♂ suffused with dark grey towards costa, with ridge of projecting scales overhanging upper margin of cell.

Maskeliya, Ceylon (de Mowbray); in May, two specimens.

Eucosma, Hb.

The genera *Cydia* and *Notocelia* are now merged in this.

Eucosma celerata, n. sp.

♂. 9-10 mm. Head dark fuscous, back of crown and lower part of face suffused with whitish. Palpi dark fuscous, apical half white. Thorax white, shoulders with a dark fuscous spot. Forewings elongate, narrow,

costa gently arched, apex round-pointed, prominent, termen concave, oblique : ochreous-white, with a few scattered dark grey strigulae ; costa strigulated with black ; a semi-oval dark fuscous blotch extending along dorsum from near base to beyond middle, and reaching half across wing ; a triangular dark fuscous blotch on costa beyond middle, not reaching half across wing ; ocellus preceded and followed by some undefined leaden-grey suffusion ; a blackish irregular mark above it ; a triangular black apical spot extending into cilia, edged beneath with white : cilia ochreous-white. Hindwings with 3 absent ; grey ; cilia whitish-grey.

N. Coorg, 3,500 feet (Newcome); in May and December, three specimens.

Eucosma semicurva, n. sp.

♀. 15-16 mm. Head and thorax ochreous-white, thorax with a black posterior spot. Palpi blackish, terminal joint and upper part of second joint posteriorly white. Forewings elongate, costa gently arched, apex obtuse, termen slightly sinuate, somewhat oblique ; ochreous-white, with a few scattered black strigulae, costa with several small black spots or strigulae ; a semi-circularly curved black streak with extremities resting on costa near base and at $\frac{1}{4}$; a black spot on middle of costa ; a black spot on dorsum near base, a rather larger one before middle, and a third rounded-triangular before tornus ; a rather irregular slender black streak along upper part of termen : cilia blackish-grey on tornus with a whitish patch, beneath this black. Hindwings with 3 and 4 stalked ; rather dark grey ; cilia whitish-grey, with grey subbasal line.

Khasis ; in June, two specimens.

Eucosma cremnitis, n. sp.

♂ ♀. 13-21mm. Head, palpi, and thorax grey or fuscous. Forewings elongate, slightly dilated posteriorly, costa gently arched, in ♂ with short fold not reaching $\frac{1}{4}$, apex round-pointed, termen sinuate, somewhat oblique ; white, with some scattered grey strigulae ; costa strigulated with dark fuscous, a small dark fuscous spot on costa at $\frac{1}{4}$; a dark fuscous fascia extending from base of costa along dorsum to middle, posteriorly dilated into a blotch reaching half across wing and marked above with black : beyond this some grey suffusion, and then a dark fuscous transverse blotch before ocellus reaching more than half across wing and marked with black and a brown spot ; ocellus edged with leaden-metallic, containing three black marks adjoining its posterior edge, and surmounted by a dark fuscous blotch suffused with black above ; posterior half of costa with small dark fuscous marks terminated beneath with ferruginous-brown alternating with dark fuscous strigulae terminated with leaden-metallic ; a leaden-metallic striga before apex ; a black apical mark edged above with ferruginous-brown and beneath with white : cilia grey with rows of white points, basal half suffusedly barred with whitish. Hindwings with 3 and 4 stalked ; grey, veins dark fuscous ; cilia grey.

Horton Plains and Maskeliya, Ceylon (Green, Pole, Fletcher); Palnis, 6,000 feet (Campbell); in August, and from March to May, twelve specimens.

Eucosma legitima, n. sp.

♂ ♀. 14-15 mm. Head white, sides of crown sometimes dark fuscous. Palpi dark fuscous, terminal joint and apex of second white. Thorax whitish, with blackish spots on shoulders and each side of back. Posterior tibiae in ♂ with rough greyish hairs. Forewings elongate, somewhat dilated posteriorly, costa gently arched, without fold, apex obtuse, termen faintly sinuate, somewhat oblique; white or ochreous-white, with some scattered grey scales; upper half of basal patch dark grey marked with black; a sub-triangular black blotch on dorsum before middle, and a smaller one before ocellus; ocellus yellow-ochreous, edged with leaden-metallic, and surmounted by a blackish blotch; posterior half of costa narrowly black with pairs of whitish strigulae, space beneath this suffused with yellow-ochreous and crossed by oblique leaden-metallic strigae; apex blackish: cilia ochreous-whitish, with a dark fuscous spot above apex and two on middle of termen. Hindwings with 3 and 4 stalked; rather dark grey; cilia grey.

Khasis; in April, and from August to November, six specimens.

Eucosma solidata, n. sp.

♂ ♀. 11-13 mm. Head rather dark fuscous, face in ♂ whitish. Palpi dark fuscous, terminal joint and apex of second white. Thorax grey mixed with blackish, suffused with black anteriorly. Forewings elongate, somewhat dilated posteriorly, costa gently arched, in ♂ without fold, apex round-pointed, termen sinuate, little oblique, more so in ♀; ochreous-whitish; basal patch leaden-grey marked with black, outer edge obtusely angulated below middle; a transverse series of blackish strigulae beyond this, and two or three on costa; central fascia narrow, oblique, blackish or dark fuscous, tending to be interrupted below middle, preceded by some leaden-metallic marks, posterior edge with an abrupt black projection in middle; ocellus edged with leaden-metallic and containing four black dots; posterior half of costa black with four pairs of whitish strigulae terminating in leaden-metallic marks, space between these brownish or fuscous; a spot of blackish suffusion above ocellus, tending to connect with middle of termen; apex blackish: cilia fuscous mixed with dark fuscous and sprinkled with whitish, towards tornus suffused with whitish. Hindwings with 3 and 4 stalked; fuscous, in ♀ darker; cilia whitish-grey, with grey subbasal line.

Khasis; in April and July, three specimens.

Eucosma calligrapha, n. sp.

♂ ♀. 17-19 mm. Head and thorax bronzy-ochreous mixed with dark fuscous. Palpi pale ochreous, terminal joint and three suffused spots of

second joint dark fuscous. Forewings elongate, posteriorly dilated, costa gently arched, without fold, apex obtuse, termen faintly sinuate, vertical; light ochreous; costa on anterior half strigulated with blackish and whitish, on posterior half blackish with five white strigulae with leaden-metallic tips; a leaden-metallic stria from costa beyond middle almost to termen beneath apex; basal $\frac{3}{4}$ of wing crossed by oblique leaden-metallic and black striae not reaching costa; a triangular blackish præternal spot; ocellus margined with leaden-metallic and crossed by several black bars, surmounted by some blackish suffusion; a blackish mark on middle of termen: cilia pale ochreous, with dark leaden-fuscous patches at apex and on middle of termen, and sometimes other bars. Hindwings with 3 and 4 connate; dark fuscous; cilia whitish-fuscous, with dark fuscous subbasal line.

Khasis; Dawna Hills, Burma (Annandale); from August to October, and in March, eight specimens. Allied to *isogramma* and *speculatrix*.

Eucosma melanoneura, n. sp.

♂ ♀. 13-15 mm. Head and thorax light greyish-ochreous, face and dorsal area of thorax in ♀ suffused with blackish. Palpi pale greyish; whitish towards apex and above. Forewings elongate, rather narrow, costa gently arched, without fold, apex obtuse, termen sinuate, little oblique; brownish, suffusedly irrorated with grey whitish-tipped scales; costa obscurely strigulated with blackish and whitish, on posterior half giving rise to some indistinct oblique leaden-greyish strigæ; some narrow dark fuscous suffusion along dorsum from base to near middle, and on a patch before tornus; ocellus edged with two obscure leaden-metallic streaks; a small ferruginous-brown apical spot. Cilia brownish with several suffused blackish lines and some whitish points, base whitish. Hindwings with 3 and 4 stalked; subhyaline, with violet-purple iridescence, apex and termen suffused with rather dark grey; veins in ♂ black, in ♀ dark fuscous; cilia pale bluish-grey, darker towards base. Undersurface of forewings in ♂ with blackish subcostal suffusion from base to beyond middle, and blackish streak along lower margin of cell.

Khasis; in October and November, two specimens.

Eucosma cyanopis, n. sp.

♂. 14-15 mm. Head light greyish-ochreous. Palpi ochreous-whitish, second joint spotted with dark grey suffusion. Thorax pale greyish-ochreous spotted with blackish. Forewings elongate, somewhat dilated posteriorly, costa gently arched, without fold, apex round-pointed, termen sinuate, somewhat oblique; pale ochreous irregularly mixed with grey and white; a large black patch overlaid with deep indigo-blue extending along costa from base to beyond middle and reaching to near dorsum, lower edge triangularly emarginate before middle of wing, posterior edge oblique-convex; costa posteriorly strigulated with black and white, giving rise to two or three oblique leaden-metallic strigæ; an irregular streak of blackish

suffusion running from lower angle of costal patch to apex ; ocellus obscurely edged with leaden-metallic and marked with blackish ; a black terminal line : cilia pale ochreous mixed with grey and sprinkled with whitish. Hindwings with 3 and 4 stalked ; grey, thinly scaled, with violet reflections, veins and termen dark fuscous ; cilia grey, tips whitish.

Khasis ; in September and October, two specimens.

Eucosma ludicra, n. sp.

♂ ♀. 13-15 mm. Head, palpi, and thorax light yellow-ochreous. Forewings elongate, somewhat dilated, costa gently arched, without fold, apex obtuse, termen slightly sinuate, somewhat oblique ; light yellow-ochreous, in and above cell suffused with ferruginous-brown, veins posteriorly marked with ferruginous-brown lines ; costa indistinctly strigulated with ferruginous-brown, whitish-sprinkled on interspaces ; some more or less developed dark fuscous strigulation about submedian fold from near base to before middle ; a silvery-metallic transverse mark before median portion of termen preceded by three short blackish dashes ; an oblique silvery-metallic mark before apex : cilia whitish-ochreous sprinkled with ferruginous-ochreous. Hindwings with 3 and 4 stalked ; grey, in ♂ paler ; cilia whitish, dorsum in ♂ clothed with long rough expanded blackish bristly hairs.

N. Coorg, 3,500 feet (Newcome) ; in November, four specimens.

Eucosma spicea, n. sp.

♂. 13 mm. Head and palpi whitish-ochreous, second joint of palpi with a faint fuscous spot. Thorax ochreous. Posterior tibiae and basal joint of tarsi densely tufted with whitish hairs, posteriorly suffused with light greyish. Forewings elongate, moderate, posteriorly dilated, costa slightly arched, without fold, apex obtuse, termen rounded, somewhat oblique ; pale ochreous ; costa strigulated with blackish and whitish ; a broad suffused ferruginous median streak from base to end of cell and thence to apex, sprinkled with blackish posteriorly, terminal area of wing suffused with light ferruginous ; two or three oblique leaden-metallic strigæ from posterior half of costa ; leaden-metallic marks on middle of termen and tornus ; cilia whitish-yellowish, with ochreous subbasal line. Hindwings with rather contorted subdorsal fold, 3 and 4 stalked ; dark grey, towards, base lighter and thinly scaled ; cilia pale grey, with dark grey subbasal line.

Khasis ; in June, one specimen.

Eucosma litigiosa, n. sp.

♂ ♀. 20-22 mm. Head and thorax grey mixed with dark fuscous and sprinkled with whitish. Palpi dark fuscous sprinkled with whitish. Forewings elongate, rather narrow, posteriorly somewhat dilated, costa gently arched, without fold, apex obtuse, termen somewhat sinuate, little oblique ; grey, irregularly mixed with white and strigulated with dark fuscous, sometimes partially suffused with brownish or light ochreous, especially tending to form a patch in disc beyond middle ; costa spotted and strigulated with

blackish; edge of basal patch irregularly marked with blackish, angulated below middle; central fascia represented by a dark fuscous spot on costa and a trapezoidal blackish blotch before tornus; a very irregular-edged black streak extending from disc at $\frac{3}{4}$ to apex; ocellus very obscurely edged with leaden-grey and whitish, and mixed with blackish: cilia grey irrorated with whitish, partially obscurely barred with dark fuscous. Hindwings with 3 and 4 connate: thinly scaled, semitransparent iridescent-grey; veins and termen dark fuscous; cilia whitish-grey, with grey subbasal shade.

Khasis; in June, September, and October, five specimens.

Eucosma numellata, n. sp.

♂ ♀. 11-13 mm. Head and thorax dark fuscous mixed with yellow-ochreous, face ochreous, lower part whitish. Palpi whitish-ochreous, spotted with dark fuscous suffusion. Forewings elongate, posteriorly dilated, costa gently arched, without fold, apex obtuse, termen slightly sinuate, somewhat oblique; blackish-fuscous, irregularly strewn with pale ochreous scales and strigulae; two leaden-metallic striae near base reaching from costa half across wing; two subconfluent pairs of leaden-metallic angulated striae before middle, rising from pairs of white costal strigulae; a third similar beyond middle, but not reaching dorsum; ocellus enclosed by two leaden-metallic streaks; a very oblique leaden-metallic striga from a white strigula on costa at $\frac{2}{3}$ to near termen beneath apex; three pairs of white costal strigulae posteriorly, last giving rise to a short leaden-metallic striga: cilia whitish-ochreous, with dark leaden-grey subbasal line, on tornus suffused with grey. Hindwings with 3 and 4 connate; dark fuscous, lighter towards base; cilia pale fuscous, with darker subbasal line.

Khasis; in March and October, three specimens. Very like *speculatrix*, but termen of forewings less sinuate, and ♂ immediately distinguished by different colour of hindwings.

Eucosma lasiura, n. sp.

♂. 21-22 mm. Head and thorax dark fuscous. Palpi ascending, fuscous. Abdomen rather elongate, posterior half clothed with dense rough expandible lateral tufts of fuscous scales meeting above. Posterior tibiae with rough projecting pale greyish-ochreous scales above and beneath. Forewings elongate, posteriorly dilated, costa gently arched, without fold, apex rounded-obtuse, termen rounded, little oblique; fuscous, strigulated and marbled with dark fuscous; costa spotted with dark fuscous, strigulated with fuscous-whitish between the spots; a quadrate dark fuscous spot beneath middle of disc; an ochreous-whitish discal dot at $\frac{2}{3}$, preceded by a spot of dark fuscous suffusion; cilia fuscous, with dark fuscous subbasal shade. Hindwings as broad as forewings, dorsal area folded over into a deep pocket and clothed with long rough hairs with a thickened glandular area, 3 and 4 connate; fuscous; cilia whitish-fuscous, with fuscous subbasal shade.

N. Coorg, 3,500 feet (Newcome); in August, two specimens. Very similar superficially to *helota*, but distinguished by the sexual characters, especially the absence of the costal fold, which in *helota* is long; a third very similar species is *brachyptycha* (described from Australia, but occurring also in Ceylon) which has a short costal fold.

Lohesia genialis, n. sp.

♂. 12 mm. Head whitish-ochreous, face suffused with white, crown with two blackish spots. Palpi pale ochreous irrorated with dark fuscous, terminal joint, apex of second, and base white. Thorax ochreous mixed with whitish and transversely barred with blackish. Abdomen elongate, ochreous, anal segment with two black basal dots. Posterior tibiae and basal joint of tarsi clothed with rough whitish scales above. Forewings elongate, narrow at base, posteriorly somewhat dilated, costa almost straight, with elongate glandular swelling beyond middle, apex obtuse, termen rounded, rather strongly oblique; light brownish-ochreous mixed with leaden-grey and white, with fine scattered black scales; basal patch irregularly marked with deeper ochreous and black, outer edge very obtusely angulated in middle; space between this and central fascia suffused with grey on dorsal half; central fascia ochreous-brown, direct, posterior edge with strong acute-triangular projection in middle, marked with a curved black streak along costal half; a small blackish spot on posterior portion of costal gland; a triangular dorsal spot between central fascia and tornus irrorated with dark grey and blackish; four pairs of whitish strigulae on posterior half of costa, last giving rise to a circularly curved white line which cuts off a brown apical spot centred with blackish; a brownish blotch before middle of tornus, above convex and limited by a white line running to termen above middle, beneath undefined: cilia light ochreous suffused with whitish except round apex. Hindwings with termen deeply excavated so as to form an elongate narrow apical lobe or projection and broader rounded dorsal lobe; white, apical lobe rather dark grey; cilia whitish, round apex grey.

Peradeniya, Ceylon (Green); in January, one specimen.

Polychrosis cellifera, n. sp.

♂ ♀. 14-15 mm. Head, palpi, and thorax pale ochreous mixed with brownish and dark fuscous. Posterior tibiae in ♂ clothed with whitish hairs above, basal joint of tarsi with long projecting brush of whitish hairs. Forewings suboblong, rather narrowed anteriorly, costa gently arched, apex obtuse, termen rounded, little oblique; pale ochreous mixed with brownish-ochreous and grey; basal patch strigulated with blackish, outer edge only defined by a small dark spot on costa and a slight angulated mark in disc; central fascia irregular, brown, reaching from costa $\frac{2}{3}$ across wing, strongly marked with black from costa to near middle of wing; costa posteriorly dark fuscous with four pairs of grey-whitish strigulae, beneath

this narrowly reddish-brown; a narrow grey and brown subterminal fascia marked with black dashes on veins, constricted or almost interrupted in middle; a short brown or grey streak marked with black along median portion of termen: cilia brownish or fuscous irrorated with whitish, with two dark fuscous lines becoming obsolete towards tornus. Hindwings in ♂ with subdorsal fold; fuscous, lighter anteriorly; cilia whitish-fuscous, with darker subbasal line.

Colombo, Ceylon (Mackwood); Pusa (Fletcher); in July, two specimens.

Statherotis decorata, Meyr.

♀. 19 mm. Head and thorax brown mixed with dark fuscous, lower half of face whitish, thoracic crest mixed with whitish. Abdomen dark fuscous. Forewings brown sprinkled with dark fuscous; an undefined basal patch strigulated with black; a semioval reddish-brown blotch extending along costa from $\frac{1}{3}$ almost to apex, on costal edge shortly strigulated with black. on lower edge margined anteriorly by a thick curved black streak from costa to beyond its middle, and posteriorly by an irregular black streak running from apex towards tornus $\frac{3}{4}$ across wing and dilated into a blotch in its central portion, the opening between these two streaks somewhat whitish-mixed; a short blackish streak along median portion of termen: cilia brown mixed with dark fuscous. Hindwings dark grey, cilia grey, with dark grey subbasal line.

Madulsima, Ceylon, in March (Green). This sex, which differs considerably in colouring from the ♂, has not been described before.

Argyroploce lamyra, Meyr.

Kegalle, Ceylon (Alston); one specimen. Described from Queensland, and not hitherto recorded elsewhere.

Argyroploce compsis, n. sp.

♀. 13 mm. Head grey. Palpi grey, with a blackish band. Thorax grey, crest blackish. Forewings elongate, costa gently arched, apex obtuse, termen slightly rounded, somewhat oblique; leaden-grey with faint purplish reflections; costa strigulated with black and whitish; two black dots near base, and one beneath costa at $\frac{1}{5}$; a triangular blackish white-edged blotch on dorsum at $\frac{1}{3}$, reaching more than half across wing: central fascia blackish on upper half, blackish-sprinkled but little marked on lower, white-edged on posterior margin, broadest in middle, beneath this suddenly narrowed and with a triangular slightly whitish-edged prominence downwards from anterior margin; an oblique transverse spot from costa at $\frac{2}{3}$, upper half blackish, lower half ferruginous-brown with two black bars; a blackish blotch before middle of termen, touching central fascia and termen, suffused beneath, convex and white-edged above; two small dark fuscous spots on costa posteriorly, terminated beneath with ferruginous-brown and a black dot; a small dark fuscous apical spot: cilia grey sprinkled with bluish-white, on upper half of

termen obscurely barred with dark fuscous. Hindwings grey, thinly scaled anteriorly, broadly suffused with dark fuscous towards termen; cilia whitish-grey, with dark grey subbasal line.

Maskeliya, Ceylon (Alston); in November, one specimen.

Argyroploce scolopendrias, n. sp.

♂. 19 mm. Head, palpi, and thorax reddish-fuscous mixed with blackish. Posterior tibiæ without tufts. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex round-pointed, termen somewhat sinuate, rather oblique; crimson-fuscous, indistinctly striated longitudinally with blackish in disc, suffused with ochreous-whitish towards base in middle; costa strigulated with blackish and whitish; a slender black submedian streak from base to beyond middle, edged beneath with ochreous-brown suffusion; dorsal area beneath this forming a broad pale ochreous streak continued across tornus and as a broad terminal patch indistinctly lined with brownish to apex, where it is terminated by an oblique white mark; a white transverse linear mark on end of cell, and a black median streak from this to termen: cilia ochreous-whitish, with a reddish-fuscous bar at apex, and two on middle of termen. Hindwings with 3 and 4 stalked; light greyish-ochreous; cilia ochreous-whitish, with grey subbasal line.

Nilgiris, 6,000 feet (Andrewes); in May, one specimen. Very similar to *scorpiastis*, but forewings more elongate, termen more oblique, dorsal pale area forming a uniform band with straight black upper edge, hindwing paler.

Argyroploce scorpiastis, n. sp.

♂ ♀. 16-18 mm. Head and thorax fuscous, often reddish-tinged, sometimes mixed with dark fuscous. Palpi reddish-whitish barred with blackish suffusion. Posterior tibiæ without tufts. Forewings elongate, moderate, somewhat dilated posteriorly, costa gently arched, apex obtuse, termen slightly sinuate, little oblique; crimson-fuscous, lighter and more crimson-tinged towards costa; costa obliquely strigulated with dark reddish-fuscous and sometimes with whitish; basal $\frac{2}{3}$ longitudinally striated with ochreous-whitish in disc, mixed with black between striæ; a white transverse linear mark on end of cell, space between this and termen streaked longitudinally with ochreous whitish or brownish-ochreous, with a black median streak: a pale ochreous semioval patch extending along dorsum from $\frac{1}{4}$ to $\frac{3}{4}$, brownish-edged towards upper edge posteriorly, edged with whitish above; tornal area suffused with whitish-ochreous; dorsum and termen dotted with blackish: cilia whitish-ochreous, with a dark fuscous bar at apex and two in middle of termen. Hindwings with 3 and 4 stalked; fuscous; cilia ochreous-whitish, with fuscous subbasal line.

Khasis; in October and November, four specimens.

Argyroploce antaea, n. sp.

♂ ♀. 15-17 mm. Head fuscous, crown suffused with blackish, lower part of face whitish. Palpi whitish, second joint with a more or less marked black bar. Thorax whitish fuscous, with suffused dark fuscous dorsal stripe, crest blackish. Posterior tibiæ in ♂ with long ochreous-whitish scales towards apex above. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex obtuse, termen slightly sinuate, vertical; brownish-ochreous, somewhat blackish-sprinkled, veins towards termen marked with blackish lines; costa black with pairs of white strigulae giving rise to very oblique whitish strigæ crossing subcostal area only a whitish streak along submedian fold from base to $\frac{3}{4}$, and a patch of undefined whitish suffusion on tornus, tending to form streaks between veins; a streak of blackish suffusion along dorsum from base to middle: cilia whitish-ochreous, with fuscous bars at apex and in middle of termen. Hindwings with 3 and 4 stalked; rather dark fuscous; cilia fuscous-whitish, with fuscous subbasal line.

Kandy, Ceylon (Mackwood, Green); in February and from July to November, five specimens.

Argyroploce centritis, n. sp.

♂. 16 mm. Head and palpi reddish-fuscous. Thorax reddish-fuscous patagia paler, crest ferruginous. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen straight, little oblique; brown; a black dot towards costa at $\frac{1}{4}$, and a few small scattered blackish dots in disc posteriorly; a streak of whitish irroration along dorsum from $\frac{1}{4}$ to tornus, anterior half of upper edge forming a triangular projection which reaches half across wing, and there is a second shorter projection beyond this, dorsal edge marked with a brown spot beneath first projection and a smaller one between the two: cilia brown, on tornus grey. Hindwings grey, thinly scaled, termen rather broadly suffused with dark fuscous; cilia whitish, with dark grey subbasal line.

Khasis; in November, one specimen. Allied to *caryactis*.

Argyroploce sandycota, n. sp.

♂. 12 mm. Head and thorax reddish-ochreous spotted with blackish. Palpi whitish-ochreous suffused with reddish-orange towards apex, with a blackish spot on base of second joint. Forewings elongate-triangular; costa gently arched, apex rounded-obtuse, termen rounded, little oblique; orange red, irregularly reticulated with dark fuscous; costa strigulated with black, interspaces posteriorly whitish; a blackish streak along dorsum from base to $\frac{2}{3}$ and a blackish spot on costa at $\frac{1}{4}$; a larger irregular blackish spot on costa beyond middle, and the reticulation coalesces into irregular markings in disc posteriorly and before tornus. Hindwings dark grey, thinly scaled anteriorly; cilia grey, with darker subbasal line.

Hakgala, Ceylon (Green); in April, one specimen.

Argyroploce iophaea, n. sp.

♂ ♀. 13-15 mm. Head white, crown tinged with grey. Palpi white, second joint with two faint grey or brownish spots. Thorax crimson grey mixed with white, thoracic crest large, dark crimson-brown. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen sinuate, little oblique; crimson-brown or deep crimson, often partially strewn with suffused whitish strigulae, and marked with suffused iridescent-violet striae; base narrowly whitish; a flattened-triangular patch, of blackish suffusion extending along costa from near base to near apex, and reaching in middle half across wing, marked with oblique bluish-leadен-metallic strigae rising from pairs of whitish costal strigulae; some blackish and leaden-metallic suffusion towards dorsum, especially on anterior half and on tornus; a more or less marked whitish-ochreous streak along termen; a fine black terminal line: cilia whitish-ochreous, sometimes suffused with crimson on outer half, sometimes with a dark leaden-fuscos patch beneath tornus. Hindwings fuscous; cilia pale fuscous, with darker subbasal line.

Maskeliya, Ceylon (Pole, Alston); in May, June and November, four specimens.

Argyroploce microplaca, n. sp.

♂ ♀. 8-9 mm. Head, palpi, and thorax dark fuscous. Forewings elongate, narrow, costa slightly arched, apex round-pointed, termen sinuate, hardly oblique; blackish-fuscous, crossed by suffused blue-leadен-metallic striae rising from oblique white costal strigulae; a pale yellow-ochreous transverse patch reaching from termen close before tornus $\frac{3}{4}$ across wing, and touching an oblique apical wedge-shaped strigula of same colour: cilia pale yellow-ochreous. Hindwings grey; cilia light grey.

Khasis; in October and November, three specimens.

Argyroploce anemodes, n. sp.

♀. 12-13 mm. Head fuscous. Palpi iridescent-white, second joint with two spots of dark grey suffusion. Thorax blackish. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex, obtuse, termen almost straight, vertical; dark purple-fuscous suffused with blackish, finely sprinkled with minute ochreous points, a basal patch of leaden-metallic striation mixed with whitish, outer edge oblique and extended as a dorsal streak to ocellus; a blotch of leaden-grey markings mixed with white on costa before middle; three white costal strigulae beyond this; two stronger white strigulae enclosing apex; ocellus margined anteriorly by a double blue-leadен-metallic streak, and posteriorly by a blue-leadен-metallic whitish-edged spot cut by a blackish dash: cilia fuscous mixed with leaden-grey and dark fuscous, sometimes suffused with whitish-ochreous on tornus. Hindwings dark fuscous, more blackish posteriorly; cilia grey-whitish, with dark grey subbasal shade.

Kandy, Ceylon (Green); in June and August, two specimens.

Argyroploce pyrrhocrossa, n. sp.

♂ ♀. 15-16 mm. Head, palpi, and thorax light brownish finely sprinkled with fuscous or dark. Abdomen blackish-grey, in ♂ rather elongate. Forewings elongate, posteriorly slightly dilated, costa slightly arched, apex obtuse, termen sinuate, vertical; brownish, finely irrorated with whitish and dark fuscous; costal edge blackish strigulated with whitish; some undefined darker median suffusion from base to middle; a similar patch on tornus; two short oblique-leadened-metallic strigæ from costa posteriorly: cilia brown-reddish, at apex dark fuscous. Hindwings dark fuscous, more blackish posteriorly; cilia whitish-grey, with dark fuscous subbasal line.

Khasis; in March and November, three specimens. Specially characterised by the contrasted reddish cilia of forewings.

Pammene homotorna, n. sp.

♂ ♀. 11-13 mm. Head, thorax, and abdomen dark fuscous. Palpi ascending, pale whitish-ochreous. Forewings elongate-triangular, costal edge gently arched, apex rounded-obtuse, termen slightly rounded, rather oblique; 7 to apex; dark purplish-fuscous, sprinkled with blue-whitish points, costa with pairs of fine whitish strigulæ; anterior half of wing mostly covered by suffused curved leadened-metallic striæ; a thick curved blue-leadened-metallic striæ from $\frac{2}{3}$ of costa to tornus, lower portion with two short projections anteriorly; a subterminal series of black dots or short dashes strongest towards apex of wing: cilia whitish-fuscous, with dark fuscous basal and subapical shades, latter obsolete towards tornus. Hindwings with 3 and 4 stalked; dark fuscous, suffused with blackish posteriorly; cilia as in forewings.

Khasis; in June and September, six specimens.

Pammene theristis, n. sp.

♂ ♀. 11-14 mm. Head, thorax and abdomen dark fuscous. Palpi ascending, ochreous-whitish, in ♂ sprinkled with grey, in ♀ irrorated with dark fuscous. Forewings elongate, posteriorly dilated, costa slightly arched, apex obtuse, termen hardly sinuate, little oblique; 7 to termen; dark purplish-fuscous, slightly sprinkled with purple-whitish points; costa shortly strigulated with blackish; two sharply-marked ochreous white wedge-shaped costal strigulæ before apex; a blackish stria from costa at $\frac{2}{3}$ to termen above middle, in ♂ preceded and followed by blue-leadened-metallic strigæ: cilia rather dark purplish-fuscous, with blackish basal line. Hindwings with 3 and 4 stalked: dark fuscous, darker posteriorly; cilia fuscous-whitish, violet-iridescent, with dark fuscous basal line.

Maskeliya, Ceylon (Pole, de Mowbray); Kumaon; in May, June and October, four specimens. Bred from seedlings of *Shorea robusta* (Indian Forest Service).

Pammene peristictis, n. sp.

♂. 8-10 mm. Head, thorax and abdomen dark fuscous. Palpi rather

long, porrected, pale ochreous-yellowish, with a dark violet-fuscous oblique apical bar. Forewings subtriangular, costa posteriorly moderately arched; apex very obtuse, termen somewhat sinuate beneath apex, vertical; 7 to termen; dark purplish-fuscous, slightly sprinkled with whitish points, with some irregular indistinct broken darker transverse striae; a nearly straight blackish stria from costa beyond middle to termen beneath apex; several blackish dots close before termen between this and tornus: cilia purplish-leadens-fuscous, with blackish basal line. Hindwings with 3 and 4 stalked; dark fuscous, basal half suffused with purple-blackish, termen somewhat paler-suffused; cilia fuscous. Undersurface of forewings with a blackish patch in middle of disc.

Maskeliya, Ceylon (Pole); in March, five specimens.

Laspeyresia prolopha, n. sp.

♂ ♀. 11-12 mm. Head and thorax grey with bluish iridescence, thorax obscurely barred transversely with darker. Palpi grey mixed with whitish, violet-iridescent. Abdomen dark fuscous, in ♂ ochreous-whitish beneath and on lateral patches before apex. Forewings suboblong, costa gently arched, bent in middle, with a projection of rough scales on bend, apex obtuse, termen slightly sinuate, vertical; dark purplish-fuscous, mostly overlaid with bluish-leadens-metallic suffusion, which covers most of basal and costal area anteriorly, a patch on middle of dorsum and two patches enclosing ocellus; two very oblique series of short black dashes crossing costal area posteriorly, with a blue leadens striga between them; some short whitish strigulae on posterior half of costa, a pale ochreous dot in disc at $\frac{2}{3}$: cilia purplish-fuscous, with blackish subbasal line. Hindwings with 6 and 7 somewhat approximated towards base; dark fuscous, a suffused whitish-fuscous discal patch; cilia white, towards tornus violet-iridescent, with dark fuscous subbasal line. Undersurface of forewings with a whitish streak beneath cell; of hindwings with a whitish subdorsal streak, in ♂ surrounded with blackish suffusion, and a whitish patch in disc.

Khasis; in June and July, eight specimens.

Laspeyresia optica, n. sp.

♂. 16 mm. Head and thorax fuscous. Palpi fuscous suffusedly irrorated with whitish. Abdomen dark fuscous. Forewings elongate, moderate, posteriorly dilated, costa gently arched, apex obtuse, termen hardly sinuate, vertical; dark prismatic-fuscous, with strong green reflections, finely irrorated with pale ochreous-tinged points; costa very shortly and obscurely strigulated with blackish and whitish; three blue-metallic oblique strigae from posterior half of costa, second short, beneath it an oblique series of two or three indistinct short blackish dashes; ocellus forming a bluish-leadens-metallic transverse patch, anterior angle touching first striga, its upper portion suffused with ground colour and finely striated longitudinally with blackish; a short distinct ochreous-white blue-tipped costal strigula before

apex: cilia purplish fuscous, round apex and upper half of termen lighter and bluish metallic, with blackish basal line. Hindwings with 6 and 7 rather approximately towards base; blackish; a suffused irregular whitish median band, not reaching margins, cut by blackish streaks on veins; cilia white with violet-blue iridescence, with dark fuscous basal line, round apex grey. Undersurface of forewings with white streak along lower margin of cell.

Khasis; in June, one specimen.

Laspeyresia pulverula, n. sp.

♂. 14 mm. Head and thorax dark fuscous irrorated with pale greyish-ochreous, face whitish-ochreous. Palpi whitish. Abdomen dark fuscous. Forewings elongate-triangular, costa slightly arched, apex obtuse, termen slightly rounded, somewhat oblique; dark purple-fuscous, anterior $\frac{3}{4}$ closely irrorated with ochreous-whitish, leaving an oblique dark fuscous mark crossing submedian fold before middle; costal area suffused with brown on posterior half, edge strigulated with whitish; a short oblique blackish striga from middle of costa and another from beneath costa at $\frac{3}{4}$ to above middle of termen, each followed by a purple-leadен-metallic striga; ocellus margined by ochreous-whitish irroration and very obscure leaden-metallic streaks: cilia grey, with black basal line. Hindwings with 6 and 7 approximated towards base; dark fuscous, with broad blackish terminal band; a suffused whitish spot in middle of disc; cilia white, with blackish basal line. Undersurface of forewings with streak of whitish suffusion along lower margin of cell; of hindwings with larger whitish discal patch.

Khasis; in June, one specimen.

Laspeyresia leucostoma, n. sp.

♂ ♀. 11-15 mm. Head dark fuscous, face white. Palpi white. Thorax grey, with a more or less developed blackish bar behind collar. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen straight, little oblique; purplish-fuscous suffused with blackish, with irregular broken violet-leadен-metallic striæ rising from pairs of whitish costal strigulæ; ocellus enclosed by two violet-leadен-metallic streaks, anterior duplicated, posterior followed by an irregular whitish-ochreous termina streak; upper half of ocellus suffused with whitish-ochreous; an irregular patch of whitish-ochreous suffusion above ocellus; two larger yellowish-white strigulæ at apex: cilia leadен-grey with a dark fuscous basal line finely edged with ochreous-white, more broadly at apex. Hindwings dark fuscous, thinly scaled on basal half; cilia iridescent-whitish with dark fuscous basal line.

Maskeliya, Ceylon (Alston); Palnis (Campbell); Khasis; from May to October, eight specimens.

Laspeyresia turifera, n. sp.

♂. 13 mm. Head yellow, sidetufts of crown dark fuscous. Palpi yellow, base brownish. Thorax and abdomen dark fuscous. Forewings

moderate, posteriorly dilated, costa slightly arched, apex obtuse, termen rounded, little oblique; dark brownish, strigulated with dark fuscous; a broad bright yellow transverse band extending from near base to middle posterior edge straight, vertical, rather irregular, costal edge strigulated with dark fuscous: cilia brownish with two dark fuscous shades. Hindwings with 6 and 7 approximated towards base; dark fuscous; cilia grey with dark fuscous basal line.

Khasis; in March, one specimen.

Laspeyresia primigena, n. sp.

♂. 11-13 mm. Head with appressed scales, blackish reticulated with whitish. Palpi transversely compressed, white, with black anterior streak. Thorax blackish transversely barred with whitish. Forewings rather elongate-triangular, costa gently arched, apex obtuse, termen rounded, somewhat oblique; bronzy-blackish; basal $\frac{2}{5}$ of wing sharply strigulated with whitish; a patch of about four incurved whitish striæ from middle of dorsum reaching $\frac{3}{5}$ across wing, apices tending to be broken up and connected into longitudinal striæ; several ochreous-white strigulæ from costa posteriorly, whence proceed some faint oblique strigæ of whitish irroration, and two or three short oblique shining blue-metallic strigæ; a shining blue-metallic dot in disc beyond middle; ocellus marked with two transverse ochreous-whitish streaks and enclosed by shining blue-metallic streaks, interior broken into spots; a short shining blue-metallic mark beneath apex: cilia rather dark purple-fuscous, with black basal line. Hindwings with 6 and 7 approximated towards base; blackish-fuscous: a thinly scaled fuscous-whitish elongate patch extending in disc from base to beyond middle; cilia white, with blackish basal line.

Khasis; in October and November, two specimens. The peculiar character of the palpi and head appears to show undoubted affinity to the *Glyphipterygidae* marking this as an early type of the genus; but the neuration is as in typical forms of *Laspeyresia*.

(To be continued.)

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN
"THE FAUNA OF BRITISH INDIA."
SERIES IV, PART III.

By

SIR GEORGE F. HAMPSON, BART., F.Z.S., F.E.S.

(Continued from page 446 of this Volume.)

Genus MONODES.

			Type.
<i>Monodes</i> , Guen. Noct., i., p. 240 (1852)	..	..	<i>nucicolora</i> .
<i>Alpesa</i> , Wlk., xv., 1662 (1856)	..	..	<i>villicosta</i> .

Proboscis fully developed; palpi upturned, rather slender, the 2nd joint reaching to vertex of head, the 3rd moderate; frons smooth: eyes large, round; antennæ of male typically ciliated; build slender; thorax chiefly clothed with scales, the pro and metathorax with typically slight spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with ochreous costal fascia and apical mark.

a. Forewing with the reniform with white annulus
defined by black *conjugata*.

b. Forewing with the reniform almost obsolete .. *fissistigma*.

B. Forewing with the costal fascia grey, the apical
mark ochreous *trifissa*.

2537. MONODES CONJUGATA.

Hydrelia conjugata, Moore, P. Z. S. 1881, p. 369; Hmps., Cat.

Lep. Phal. B. M., viii, p. 473, pl. 134, f. 9.

Eurois albicostata, Hmps., Moths Ind. ii, p. 228 (1894).

2049 a. MONODES FISSISTIGMA.

1777 a. MONODES TRIFISSA.

Monodes trifissa, Hmps., Cat. Lep. Phal. B. M., viii, p. 475, pl. 134, f. 12, (1909).

♀. Head and thorax ochreous white tinged with rufous, the extremities of patagia with some black scales and the metathoracic crest blackish; pectus and legs suffused with fuscous brown; abdomen ochreous suffused with brown, the basal crest fuscous. Forewing with the base and costal

area to just beyond postmedial line grey slightly irrorated with black, the inner area and a broad curved fascia from end of cell to apex ochreous, the cell and area beyond its lower extremity rufous and the medial part of terminal area grey with slight dark streaks on the veins and in interspaces; subbasal line represented by a slight oblique black striga from costa; antemedial line absent; orbicular white with an ochreous tinge in centre and slightly defined by brown at sides, narrow, very oblique, its lower extremity produced to three oblique white streaks with a bar across their extremities below the reniform which is represented by a very slight ochreous lunule; an oblique ochreous streak from below the orbicular to submedian fold at postmedial line, which is very indistinct and double from costa to vein 3, strongly bent outwards below costa, bent inwards at vein 3 and sinuous to inner margin; a terminal series of black points. Hindwing greyish wholly suffused with fuscous brown; the underside ochreous irrorated with fuscous, a blackish discoidal spot, curved waved postmedial line, and terminal series of striæ.

Habitat.—PUNJAB, Simla. *Exp.* 24 mill.

Genus NEOMILICHIA.

Type.

Neomilichia., Hmps., Cat. Lep. Phal. B. M., viii, p. 518

(1909) *hylea*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd moderate; frons with slight rounded prominence with corneous plate below it; eyes large, round; antennæ of male ciliated; build slender; head and thorax clothed chiefly with scales, the pro and metathorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rectangular, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2048. NEOMILICHIA VEPRECOLA.

Genus PERIGEODES.

Type.

Perigeodes, Hmps., Cat. Lep. Phal. B. M., vii, p. 287 (1908). *rectivitta*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and moderately scaled in front, the 3rd rather long; frons smooth; eyes large, round; antennæ of male ciliated; head and thorax smoothly clothed with scales, the pro and metathorax with spreading crests, tibiæ moderately fringed with hair; abdomen with small dorsal

crests on basal segments. Forewing with the apex rectangular, the termen evenly curved and slightly crenulate, the cilia strongly dentate especially towards tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with large white patch on inner medial area
extending almost to cell *poliomera*.

B. Forewing without white patch on inner medial area
extending almost to cell.

a. Forewing with the lower part of reniform very large
and extending to well below cell *treyela*.

b. Forewing with the lower part of reniform moderate
and extending to slightly below cell.

a¹. Forewing with bifid black spot beyond lower part
of reniform.

a². Forewing yellow, the antemedial line almost
obsolete, the stigmata defined by black points. *magna*.

b². Forewing ochreous suffused with rufus, the
antemedial line double, the stigmata with pale
annuli *malayica*.

b¹. Forewing without bifid black spot beyond lower
part of reniform *rectivitta*.

2051. b. PERIGEODES POLIOMERA.

Perigeodes poliomera, Hmps., Cat. Lep. Phal. B. M., vii., p. 287.,
pl. 115. f. 11 (1908).

Head, tegulae and patagia ochreous tinged with rufous, the tegulae with darker edges; palpi black above, white below; frons with black bar; vertex of thorax, pectus and legs white, the forelegs tinged with brown, the tarsi fuscous ringed with white; abdomen white tinged with brown, the basal crest black at tip. Forewing ochreous tinged with rufous, the area below costa paler, becoming pure white at apex. A large white patch on inner area from near base to near tornus, rounded above, the terminal area redder to the oblique streak from termen just below apex, suffused with black towards tornus; the base white; traces of a double waved subbasal line from costa to submedian fold; a very indistinct double waved antimedial line, obsolete on the white area; orbicular and reniform with whitish annuli slightly defined by brown, the former with brown centre round the latter with its centre defined by black points, constricted at middle; a blackish patch beyond lower angle of cell; postmedial line double almost obsolete towards costa, strongly bent outwards below costa, then oblique, minutely waved and with series of black and white points on its

outer edge, bent outwards to inner margin at the extremity of the white patch, some slight pale points beyond it on costa; traces of a waved subterminal line; a terminal series of black points with white point before the point in submedian interspace; cilia reddish with series of black points at tips, wholly black towards tornus. Hindwing pale brown with terminal series of small dark lunules; cilia brownish white, the underside whitish, the costal area tinged with rufous, an indistinct diffused dark subterminal band from costa to vein 2, a terminal series of black points.

Habitat.—CENTRAL CHINA; HAINAN; ASSAM, Khasis. *Exp.* ♂ 32, ♀ 36 mill..

2051. a. PERIGEODES TRICYCLA.

Perigea tricycla, Guen., Noct l. p. 226 (1852); Hmps. Cat. Lep..

Phal. B. M. vii, p. 289, pl. 115, f. 12.

Bagala fuscostrigata, Beth. Baker, Nov. Zool. xiii, p. 209 (1906).

♂. Head and thorax pale ochreous mixed with dark brown and tinged with rufous; palpi with some dark brown at side of 2nd joint; antennæ brown; abdomen pale ochreous tinged with rufous, dorsally dark brown except at base. Forewing pale ochreous suffused with rufous and slightly irrorated with dark brown, the inner margin with fuscous brown fascia tinged with grey except at base, the postmedial area greyish brown except towards costa, terminated by the oblique dark brown streak from apex to the postmedial line at vein 5, diffused below; subbasal line represented by two black points below the cell; antemedial line very indistinct, double, rufous, minutely dentate, below vein 1 strongly bent inwards to inner margin; claviform represented by a dark striga at its extremity; orbicular pale, defined by brown except above, irregularly rounded; reniform pale, slightly defined by brown, strongly constricted at middle and figure-of-eight-shaped, extending well below the cell to vein 2, some dark points in its lower part, traces of an oblique line from it to inner margin; postmedial line indistinct, double, strongly bent outwards below costa, then minutely waved and oblique, some pale points beyond it on costa; subterminal line very indistinct, pale, defined on inner side by brown suffusion, slightly excurved below vein 7 at middle; a terminal series of dark points defined on inner side by pale lunules; cilia dark brown with a pale line at base. Hindwing dark brown with a reddish tinge; cilia with a pale line at base; the underside whitish tinged with brown, the terminal area suffused with brown, a brown postmedial line from costa to vein 5.

ab. 1, *fuscostrigata*—Hindwing on underside much more suffused with brown, a dark discoidal spot, the postmedial line entire.

Habitat—ASSAM, Khasis; BORNEO; BR. NEW GUINEA. *Exp.* 42-44 mill.

2051. PERIGEODES MAGNA.

2052. PERIGEODES MALAYICA.

Orthogonia malayica, Snell., Veth's Midden Sumatra Lep., p. 46, pl. 4, f. 6 (1892).

Xanthoptera nigridia, Hmps. Moths Ind., ii, p. 320 (1894).

2428. PERIGEODES RECTIVITTA.

Genus PERIGEA.

Type.

<i>Perigea</i> , Guen. Noct., i., p. 225 (1852)	<i>spicea</i> .
<i>Condica</i> , Wlk., ix., 239 (1856)	<i>cupentia</i> .
<i>Prospalta</i> , Wlk., xiii., 1114 (1857)	<i>leucospila</i> .
<i>Bagada</i> , Wlk., xv., 1753 (1858)	<i>spicea</i> .
<i>Gaphara</i> , Wlk., Trans. Ent. Soc. (3) i., p. 96 (1862) ..	<i>tetera</i> .
<i>Myrtale</i> , Druce, Biol. Centr. Am. Het. i., p. 443 (1891) ..	<i>imitata</i> .

Proboscis fully developed; palpi upturned, the 2nd joint typically reaching about to vertex of head and smoothly scaled, the 3rd typically rather long; frons smooth; eyes large, round; antennæ of male typically minutely ciliated; thorax smoothly clothed with scales, the prothorax with spreading crest, the metathorax with slight crest; tibiæ moderately fringed with hair; abdomen with slight dorsal crests on basal segments. Forewing with the apex rectangular, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

- A. Forewing with a large part of wing occupied by grey or white patches *leprosa*.
- B. Forewing with a large part of wing not occupied by grey or white patches.
 - a. Forewing cupreous black brown.
 - a¹. Forewing with subterminal and terminal series of small white spots.
 - a². Forewing with the orbicular white centre defined by white points *stellata*.
 - b². Forewing with the orbicular not defined by white points.
 - a³. Forewing with the centre of the reniform broken up into white points *contigua*.
 - b³. Forewing with round white spot in centre of reniform with small brown lunule on it .. *leucospila*.
 - b¹. Forewing without terminal series of small white spots.
 - a². Forewing with the reniform broken up into white points *albomaculata*.
 - b². Forewing with the reniform with slight white lunule on its inner edge *atricuprea*.
- b. Forewing not cupreous black brown.

- a*¹. Forewing not yellowish with patches of rufous and brown suffusion in parts.
- a*². Forewing with the reniform defined on all sides by white points.
- a*³. Hindwing white, the terminal area with dark suffusion, in female more suffused.. *dolorosa*.
- b*³. Hindwing entirely suffused with brown in both sexes *galavria*.
- h*². Forewing with the reniform not defined on all sides by white points *capensis*.
- h*¹. Forewing with the ground colour yellowish with patches of rufous and dark brown suffusion .. *spicea*.

2439*a*. PERIGEA LEPROSA.

1722*a*. PERIGEA STELLATA.

Prospalta stellata, Moore, Lep. Atk., p. 111 (1882); Hmps., Cat. Lep. Phal. B. M. vii., p. 314, pl. 115, f. 27.

Head rufous, the basal joint of antennæ with white point in front; thorax deep red brown, the base of tegulæ rufous, the vertex of thorax and tip of prothoracic crest white; tarsi with white points; abdomen brown, the basal crest white, the others black, the ventral surface rufous. Forewing cupreous brown suffused with black leaving the discal and submedian folds redder; five white points at base in and below cell, followed by an oblique white striga from costa with two white points below it; an antemedial series of white points on and below costa and on the veins, defined by black and with white streak before it on inner margin; orbicular represented by a small white spot surrounded by white points; reniform with four white points in centre surrounded by white points; traces of a waved dark medial line; postmedial line indistinct, dark, with white point at costa, strongly bent outwards below costa, then dentate and produced to white points on the veins, oblique below vein 4, some white points beyond it on costa; a subterminal series of small white spots on the veins, reduced to points on veins 4·3·2; another series of small white spots just before termen and a series of points on termen; cilia with series of white spots at tips and points at middle towards apex. Hindwing fuscous brown, the cilia white at tips; the underside pale red-brown, the terminal area suffused with fuscous, a faint discoidal lunule and diffused minutely crenulate postmedial line.

Habitat.—SIKIM. *Exp.* 40 mill.

1722*b*. PERIGEA CONTIGUA.

Prospalta contigua, Leech, Trans. Ent. Soc. 1900, p. 122; Hmps., Cat. Lep. Phal. B. M. vii., p. 314, pl. 115, f. 28.

Head and thorax deep red-brown; basal joint of antennæ white; prothoracic crest with some white scales, the metathorax with white patch; tibiae at base with white points, the tarsi ringed with white; abdomen

brown with the basal crest white. Forewing black-brown with a cupreous gloss; two white points at base; a subbasal white striga from costa and spot below cell with point in cell further from base; antemedial line represented by a white striga from costa, points on the veins and point on inner margin further from the base; claviform a small white spot; orbicular a small round white spot defined by black; reniform with three white marks in centre surrounded by small spots; traces of a waved dark medial line; postmedial line indistinct, dark, with white points at costa, strongly bent outwards below costa, then dentate and produced to white points on the veins, excurved to vein 4, then oblique, some white points beyond it on costa; a subterminal series of small white spots on the veins, somewhat excurved below costa and at middle; a terminal series of white points. Hindwing fuscous brown, the cilia whitish, brown at tips; the underside fuscous irrorated with white; a dark discoidal lunule and diffused minutely waved postmedial line.

Habitat.—W. CHINA; ASSAM, KHASIS. *Exp.* 30—42 mill.

1723. *PERIGEA LEUCOSPILA*.

1722. *PERIGEA ALBOMACULATA*.

Mamestra albomaculata, Moore, P. Z. S. 1867, p. 52; Hmps. Cat.,

Lep. Phal. B. M. vii., p. 316, pl. 115, f. 31.

1722c. *PERIGEA ATRICUPREA*.

Perigea atricuprea, Hmps., Cat. Lep. Phal. B. M. vii., p. 316, pl. 115, f. 32 (1908).

Head and thorax black-brown with a few white scales; metathorax with white patch; tarsi slightly ringed with white; abdomen fuscous brown. Forewing glossy black-brown slightly irrorated with white; an indistinct waved whitish subbasal line from costa to submedian fold, with white point beyond it in cell; antemedial line black defined on inner side by whitish, somewhat waved and oblique; orbicular and reniform defined by black, the former round, the latter with white lunule on its outer edges and somewhat angled inwards on median nervure; faint traces of an oblique medial shade from lower angle of cell to inner margin; postmedial line black with white striga from costa, strongly bent outwards below costa, then dentate and produced to short streaks on the veins, incurved below vein 4, some white points beyond it on costa; traces of a waved dark subterminal line with waved white striga from costa, incurved below vein 3; a terminal series of white points; cilia with a slight waved white line through them. Hindwing greyish suffused with fuscous brown, a faint discoidal spot and sinuous postmedial line; a fine black terminal and some whitish on termen towards tornus; cilia with a slight whitish line through them; the underside fuscous brown irrorated with white, a brown discoidal lunule and diffused curved postmedial line.

Habitat.—SIKIHIM TIBET, Yatung. *Exp.* ♂ 34, ♀ 38 mill.

1721a. PERIGEIA DOLEROSA.

Mamestra dolerosa, Wlk. XXXII. 667 (1865).*Hadena taprobanae*, Feld. Reis. Nov. pl. 110, f. 3 (1874).*Euplevia albomaculata*, Semp. Schmett. Phil. p. 515, pl. 60. f. 2
(nec. Moore).

Head and thorax fuscous mixed with some ochreous; palpi black; the 2nd and 3rd joints white at tips; frons with black bars; tegulæ with black annuli; prothoracic crest tipped with ochreous, the metathorax with ochreous patch; pectus and legs ochreous white irrorated with brown; the tarsi black with pale tinge; abdomen ochreous suffused with fuscous brown. Forewing fuscous; subbasal line represented by ochreous striæ from costa and cell; some ochreous and black scales on inner margin before the antemedial line, which is indistinct, wavy, black, interrupted, defined on inner side by ochreous striæ at costa and inner margin and ochreous point at submedian fold; orbicular with incomplete whitish annulus defined by black, small, irregularly elliptical; reniform with irregular white lunule in centre surrounded by ochreous points defined by black, constricted at middle; postmedial line with white spot at costa, strongly bent outwards below costa, then defined by slight ochreous lunules on outer side, dentate and produced to black and white points on the veins, oblique below vein 4, some white points beyond it on costa; subterminal line represented by a series of ochreous white points defined on inner side by small dentate black marks, excurved below vein 7 and at middle; a series of minute white points just before termen; cilia fuscous with series of ochreous white points at base. Hindwing white tinged with brown, the veins and terminal area suffused with fuscous brown, a terminal series of black striæ defined by whitish on inner side; cilia ochreous white, with a slight brown line through them on apical half; the underside white, the costal area tinged with ochreous and irrorated with fuscous, a discoidal point, slight diffused wavy postmedial line from costa to vein 2, and diffused subterminal band.

Habitat.—C. CHINA; BOMBAY; MADRAS, Nilgiris; CEYLON, Kandy; PHILIPPINES, Manila; FIJI. *Exp.* 36-40 mill.

Larva, Brown. Food plant, *Conyza balsamifera*.

1721b. PERIGEIA GALAXIA.

Perigea galaxia, Butl., P. Z. S. 1883, p. 159; Hmps. Cat. Lep. Phal. B. M. vii, p. 324, pl. 116, f. 9.

Head and thorax fuscous brown mixed with grey-white; tarsi black ringed with white; abdomen grey suffused with fuscous. Forewing grey suffused with fuscous and irrorated with white; subbasal line represented by a white striga from costa; antemedial line black, defined on inner side by white towards costa, wavy, somewhat oblique; orbicular white defined by black, small, round; reniform a white lunule with some black points on

it, its upper and lower extremities surrounded by white points: a diffused medial line, excurved at middle; postmedial line black, with white bar at costa, bent outwards below costa, then dentate and produced to black and white points on the veins, incurved below vein 4, some white points beyond it on costa; subterminal line defined by diffused fuscous on inner side, angled outwards at vein 7 and excurved at middle; a terminal series of black points; cilia with a series of white points at base. Hindwing grey-brown with a fuscous tinge; cilia whitish at tips; the underside white irrorated with fuscous, a discoidal lunule filled in with white, bisinuate postmedial line, and traces of diffused subterminal band.

Habitat.—PUNJAB, Kulu, Sultanpur, Simla, Dharmsala. *Exp.* 30-38 mill.

1721. *PERIGEA CAPENSIS*.

Apamea capensis, Guen. Noct. 1, p. 213 (1852); Hmps. Cat. Lep.

Phal. B. M. vii, p. 332, pl. 116, f. 20.

Perigea apameoides, Guen. Noct. 1, p. 229 (part).

Canadrina conducta, Wlk., X, 296 (1856).

Celæna serva, Wlk. XV., 1689 (1858).

Hadena pauperata, Wlk., XV, 1727 (1858).

Mamestra prodita, Wlk., Journ. Linn. Soc. Zool. vi, p. 185 (1862).

Perigea inexacta, Wlk., XXXII, 682 (1865).

„ *canorufa*, Wlk., XXXII, 683 (1865).

„ *illecta*, Wlk., XXXII, 684 (1865).

Hadena leonina, Wlk., XXXIII, 735 (1865).

„ *spargens*, Wlk., XXXIII, 739 (1865).

„ *funesta*, Wlk., XXXIII, 740 (1865).

Perigea centralis, Moore, Lep. Ceyl. iii, p. 28, pl. 147 f. 2 (nec. Wlk.).

„ *meleagris*, Saalm. Lep. Madag., p. 271, f. 228 (1891).

2050. *PERIGEA SPICEA*.

Perigea spicea, Guen. Noct. 1, p. 226 (1852); Hmps. Cat. Lep.

Phal. B. M. vii, p. 348.

Bagada pyrochroma, Wlk., xv. 1753 (1858), Hmps. Ill. Het. B.M.

ix, p. 97, pl. 162, f. 2.

Acontia firina, Swinh., P. Z. S. 1885, p. 455, pl. 27 f. 5.

Genus *HADJINA*.

Type.

Hadjina, Staud., Iris., iv, p. 286 (1891). *lutosa*.

Proboscis fully developed; palpi upturned, the 2nd joint slender, reaching to vertex of head and moderately fringed with hair in front, the 3rd short; frons smooth; eyes large, round: antennæ of male typically ciliated; build slender; head and thorax clothed almost entirely with scales, the pro and meta-thorax with spreading crests; legs moderately fringed

with hair; abdomen with dorsal crest at base only. Forewing rather short and broad, the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3+4 from angle of cell; 5 obsolescent from well below middle of discocellulars; 6+7 from upper angle; 8 anastomosing with the cell near base only.

A. Forewing with the medial line indistinct or absent.

a. Forewing not suffused with fiery red.

a¹. Hindwing wholly tinged with brown.

a². Hindwing not ochreous.

a³. Forewing with the inner area cupreous red .. *cupreipennis*.

b³. Forewing with the inner area not cupreous red.

a⁴. Forewing purplish red-brown *chinensis*.

b⁴. Forewing fuscous brown *cinerea*.

b². Hindwing ochreous tinged with brown *modestissima*.

b¹. Hindwing white, the terminal area suffused with brown.

a². Forewing with the subterminal line excurved at middle *viscosa*.

b². Forewing with the subterminal line not excurved at middle *poliastis*.

b. Forewing suffused with fiery red *pyrooxantha*.

B. Forewing with prominent rather diffused dark medial line *grisea*.

1834 b. *HADJINA CUPREIPENNIS*.

Ilattia cupreipennis, Moore, Lep. Atk. p. 112 (1882); Hmps. n.

Cat. Lep. Phal. B. M. viii, p. 525, pl. 136, f. 13.

Head and thorax fiery red mixed with dark brown and some grey; abdomen dark brown. Forewing deep cupreous red shading to brown mixed with grey on costal and terminal areas; subbasal line represented by a slight dark striga from costa; antemedial line very indistinct, waved: claviform absent: orbicular and reniform whitish irrorated with brown and very faintly defined by brown, the former round, the latter somewhat quadrate; postmedial line very indistinct, dark, bent outwards below costa, then produced to dark streaks with grey points on them on the veins, incurved below vein 4; hardly a trace of the subterminal line; a fine punctiform black terminal line. Hindwing glossy yellowish brown: a fine dark terminal line and slight pale line at base of cilia; the underside pale tinged with red and thickly irrorated with brown, a small black discoidal lunule and traces of a curved postmedial line.

Habitat.—PUNJAB, Murree; SIKHIM, *Exp.* 30-36 mill.

1833 b. HADJINA CHINENSIS.

Perigea chinensis, Wlgrn. Wien. Ent. Mon, iv, p. 169 (1860).

Segetia mandarina, Staud. Rom. Mem. vi, p. 482, pl. ix, f. 4 (1892); id. Cat. Lep. pal. p. 170.

„ *sarepta*, Græs. Bul. Ent. Zeit. XXXII, p. 350 (1888) nec. Guen.

Anyia pulverea, Leech, Trans. Ent. Soc. 1900, p. 114.

1834c. HADJINA CINEREA.

Hadjina cinerea, Hmps. Cat. Lep. Phal. B. M. viii, p. 526, pl. 136, f. 15 (1909).

♂. Head and tegulae pale fulvous; thorax dark brown mixed with grey and a few black scales; tarsi with pale rings; abdomen grey-brown, the anal tuft ochreous. Forewing dark brown suffused with grey and irrorated with black; subbasal line represented by a slight grey striga from costa; antemedial line very ill-defined, grey, diffused, waved; claviform absent; orbicular and reniform grey irrorated with black, undefined, the former round, the latter somewhat constricted at middle; postmedial line very ill-defined, grey, diffused, bent outwards below costa and oblique below vein 4; subterminal line very indistinct, grey faintly defined by blackish on inner side, excurved below vein 7 and at middle; a terminal series of slight black points. Hindwing silky fuscous grey, the cilia slightly paler; the underside with faint black discoidal spot and traces of postmedial line.

Habitat—SIKIM, 1,800'. *E.p.* 26 mill.

1880. HADJINA MODESTISSIMA.

Apamea modestissima, Snell., Tijd. V. Ent. xx, p. 26, pl. 2, f. 14 (1877).

Hipepa opacaria, Swinh., Trans. Ent. Soc., 1890, p. 264, pl. 8, f. 3.

1834d. HADJINA VISCOSA.

Mythimna viscosa, Fr. Neue. Beitr. i., p. 39, pl. 21, f. 3, (Aug. 1831) Staud. Cat. Lep. pal., p. 170.

„ *implexa*, Treit. Schmett. Eur. x., 2, p. 73 (1835); nec. Hübn. Dup. Lep. Fr. Suppl. iv., p. 98, pl. 58, f. 7.

Head and thorax red-brown mixed with grey scales; tarsi fuscous with pale rings; abdomen ochreous. Forewing red-brown slightly irrorated with greyish ochreous; subbasal line absent; antemedial line hardly traceable, greyish, waved; claviform absent; orbicular and reniform small with faint grey annuli, undefined, the former oblique elliptical, the latter constricted at middle; postmedial line very indistinct, slightly defined by grey on outer side and with prominent grey striga from costa, bent outwards below costa and oblique below vein 4, some pale points beyond it on costa; subterminal line very indistinct, pale, angled outwards at vein 7 and slightly excurved at middle; a terminal series of blackish points; cilia with a fine pale line at base. Hindwing white, the termen tinged

with pale red-brown from apex to submedian fold, in female almost entirely suffused with brown; the underside with the costal area irrorated with red.

ab. 1.—Much more ochreous or grey irrorated with fuscous and with hardly a trace of rufous; forewing with the ante and post-medial lines more distinct, the former angled outwards in submedian fold and above inner margin and inwards on vein 1, a dark patch sometimes present between orbicular and reniform.

Habitat.—SPAIN; SICILY; CANARIES; SYRIA; PERSIAN GULF; SIND, Karachi 82. *Exp.* 28·34 mill.

1833c. HADJINA POLIASTIS.

1795a. HADJINA PYROXANTHA.

2053. HADJINA GRISEA.

Genus CATAMECIA.

Type.

Catamecia, Staud. *Iris*. x., p. 288 (1897) *jordana*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching to about middle of frons and moderately scaled, the 3rd short; frons with truncate conical prominence with slight raised edges and corneous plate below it; eyes large, round; antennæ of male typically ciliated; thorax clothed chiefly with scales, the pro and meta-thorax with spreading crests; tibiæ slightly fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rectangular, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male serrate.

1871. CATAMECIA FURTIVA.

Sect. II.—Antennæ of male ciliated.

1830. CATAMECIA MINIMA.

Apamea minima, Swinh., P. Z. S., 1889, p. 410; Hmps., Cat. Lep.

Phal. B. M., viii. p. 543, pl. 136, f. 29.

Catamecia bacheri, Staud. Cat. Lep. pal., p. 213 (1901).

Genus NAMANGANA.

Type.

Namangana, Staud. Stett., Ent. Zeit. 1888, p. 28 *cretacea*.

Eupolia, Smith, Trans. Am. Ent. Soc., xxi., p. 69 (1894). *licentiosa*.

Proboscis fully developed, palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled in front, the 3rd typically short; frons smooth; eyes large, round; antennæ of male typically ciliated; head and thorax clothed chiefly with scales, the pro and meta-thorax with spreading crests; tibiæ moderately fringed with hair; abdomen with dorsal

crest at base only. Forewing with the apex rounded, the termen evenly curved and slightly crenulate: veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle: 8 anastomosing with the cell near base only.

Sect. I. (Eupolia).—Antennæ of male bipectinate with long branches.

2054a. NAMANGANA PECTINICORNIS.

Sect. II. (Namangana).—Antennæ of male ciliated.

A. Forewing with elongate V-shaped black marks on terminal area between veins 7 and 3 *cashmirensis*.

B. Forewing without V-shaped black marked on terminal area *atrescens*.

1942. NAMANGANA CASHMIRENSIS.

1858a. NAMANGANA ATRESCENS.

Genus CINGALESA.

Type.

Cingalesa, Hmps., Moths Ind., ii., p. 336 (1894) *strigicosta*.

2108. CINGALESA STRIGICOSTA.

Genus LOPHOTYNA.

Type.

Lophotyna, Hmps., Cat. Lep. Phal. B. M., ix, p. 19 (1910). *albirena*.

Proboscis fully developed; palpi oblique, fringed with long hair in front, the 3rd joint short, porrect; frons smooth with large tuft of hair; vertex of head crested; eyes large, round; antennæ of male ciliated; head and thorax clothed almost entirely with scales, the tegulæ produced to a slight dorsal ridge, the pro-thorax with high triangular crest, the meta-thorax with spreading crest: tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex produced and acute, the termen strongly crenulate and obliquely curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with the termen waved: veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1724. LOPHOTYNA ALBIRENA.

Genus GORTYNA.

Type.

Gortyna, Treit. Schmett. Eur. v (2) p. 330 (1825) *leucostigma*.

Helotropha, Led. Noct. Eur. p. 118 (1857) *leucostigma*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short; frons smooth; eyes large, round; antennæ of male typically ciliated; head and thorax clothed chiefly with scales, the pro and meta-thorax with spreading crests

tibiæ moderately fringed with hair; abdomen with dorsal crests on basal segments. Forewing with the apex rectangular, the termen crenulate: veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell: 5 obsolescent from middle of discocellulars; 6·9 from upper angle; 8 anastomosing with the cell near base only.

1795. GORTYNA LEUCOSTIGMA.

Noctua leucostigma, Hübn., Eur. Schmett. Noct. f. 375 (1808):
Staud. Cat. Lep. pal. p. 186.

Noctua fibrosa, Hübn., Eur. Schmett. Noct. f. 385 (1808) Dup.
Lep. Fr. vii 1, p. 132, pl. 109 f. 4; Steph. Ill.
Brit. Ent. Haust. iii, p. 7.

„ *lunina*, Haw., Lep. Brit. p. 209 (1809).

Cerastis lævis. Butl., Trans. Ent. Soc. 1881, p. 181.

Hydræcia khasiana, Moore, P. Z. S., 1881, p. 342, pl. 37, f. 5.

Genus HYDRÆCIA.

Type.

Gortyna, Ochs. Schmett. Eur. iv., p. 82 (1816) non descr.:

Hübn. Verz., p. 232 (1827), nec. Treit. 1825 .. *micacea*.

Hydræcia, Dup. Cat. Meth., p. 114 (1844) .. *micacea*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and fringed with long hair in front, the 3rd short; frons smooth; eyes large, round; antennæ of male typically minutely serrate: thorax clothed with hair and hair-like scales, the tegulæ produced to a slight dorsal ridge, the prothorax with sharp triangular crest, the metathorax with spreading crest; tibiæ moderately fringed with hair; abdomen with some rough hair at base, dorsal crest on first segment and lateral fringes of hair. Forewing with the apex somewhat produced and acute, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle: 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell: 5 obsolescent from middle of discocellulars; 6·7 from upper angle: 8 anastomosing with the cell near base only.

1594. HYDRÆCIA BASALIPUNCTATA.

Genus PYRRHIA.

Type.

Pyrrhia, Hübn. Verz., p. 233 (1827) *purpurina*.

1598. PYRRHIA UMBRA.

Noctua umbra, Hüfn. Berl. Mag. iii., p. 294 (1767); Smith, Cat.
Noct. N. Am., p. 216; Staud. Cat. Lep. pal. p. 224.

„ *marginata*, Fabr. Syst. Ent., p. 610 (1775); Dup. Lep. Fr. vii.
pl. 119, f. 8; Steph. Ill. Brit. Ent. Haust. iii.,
p. 108.

Noctua rutilago, Schiff, Wien. Verz. p. 88 (1776); Hübn. Eur. Schmett, Noct. f. 185.

„ *umbrago*, Esp. Schmett, iv., pl. 185, ff. 6-7 (1796).

„ *conspicua*, Borkh. Eur. Schmett, iv., p. 50 (1792).

„ *marginago*, Haw. Lep. Brit., p. 217 (1809).

Heliothis cilisca, Guen, Noct. ii., p. 179 (1852).

„ *esprimens*, Wlk. xi., 687 (1857); Grote, Bull. Buff. Soc. Nat. Sci. ii., p. 35, pl. iii., f. 5.

Pyrrhia angulata, Grote, Trans. Am. Ent. Soc. v., p. 93 (1874); id. Bull. Buff. Soc. Nat. Sci. ii., pl. 3, f. 6.

Hydræcia tibetana, Moore, A. M. N. H. () p. 232 (1878); id. 2nd Yarkand Mission Lep., p. 9, pl. i., f. 21.

Chariclea revilliger, Christ, Iris., vi., p. 92 (1893); Staud. Cat. Lep. pal., p. 223.

Pyrrhia aconiti, Holtz., Allg. Zeitschr. Ent. vii., p. 212 (1902).

Genus CALLECIA.

Type.

Callecia, Hmps., Cat. Lep. Phal. B. M. ix., p. 56 (1910) .. *svinhœi*.

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching to about middle of frons and moderately fringed with hair, the 3rd short; frons with large corneous prominence with raised edges, the lower edge produced to a plate grooved in front, a corneous plate below it; eyes large, round; antennæ of male laminate and almost simple; thorax clothed with hair and scales mixed, the pro and meta-thorax with spreading crests; tibiæ moderately fringed with hair; abdomen without crests. Forewing with the apex rounded, the termen evenly curved and slightly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from well below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2025. CALLECIA SVINHÆI.

Genus CYTOCANIS.

Type.

Cytocanis, Hmps., Cat. Lep. Phal. B. M., ix., p. 110 (1910). *denticulosa*.

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching about to middle of frons and moderately fringed with scales in front, the 3rd moderate; frons with large corneous prominence with raised edges, its lower edge produced to a beak-like process; eyes large, round; antennæ of male laminate and almost simple; thorax clothed almost entirely with scales and without crests; tibiæ smoothly scaled, the joints of fore tarsi rather short and the fungues rather large; abdomen without crests. Forewing with the apex rounded, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper

angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from well below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2016. CYTOCANIS DENTICULOSA.

Genus ELYDNA.

Type.

Elydna, Wlk. xv., 1712 (1858) *transversa*.

Dyrzela, Wlk., xv., 1758 (1858) *plagiata*.

Dadica, Moore, P. Z. S. 1881, p. 349 *lineosa*.

Radinacra, Butl., A. M. N. H. (5) i., p. 161 (1878) *cinerascens*.

Leucocosmia, Butl., Trans. Ent. Soc., 1886, p. 394 *reclusa*.

Floccifera, Hmps., Moths. Ind. ii., p. 281 (1894) *erigida*.

Sect I.—Antennæ of male bipectinate with long branches to just beyond middle, the apical part ciliated.

1885. ELYDNA BOSCA.

Sect II.—(*Dyrzela*).—Antennæ of male strongly serrate above to middle, strongly fasciculate below.

1886. ELYDNA PLAGIATA.

Sect III.—Antennæ of male ciliated.

A. (*Leucocosmia*). Vertex of head of male with a cleft corneous ridge clothed with scales; abdomen clothed with woolly pile; fore and hindwings clothed with woolly hair above.

1875. ELYDNA RECLUSA.

Prodenia reclusa, Wlk., Journ. Linn. Soc. Zool. vi, p. 185 (1862).

Amphipyra agrotoides, Snell, Tijd. v., Ent. 1880, p. 77, pl. 6, f. 6.

Radinacra thoracica, Moore, Lep. Ceyl. iii, p. 31, pl. 148, f. 4. (1884).

Leucocosmia ceres, Butl. Trans. Ent. Soc., 1886, p. 394, pl. 9, f. 10.

Caradrina euthusa, Hmps., Ill. Het. B. M. viii, p. 79, pl. 145, f. 1 (1891).

„ *heliarcha*, Meyr., Trans. Ent. Soc., 1897, p. 370.

„ *unipunctata*, Beth. Baker, Nov. Zool. xiii., p. 201 (1906).

„ *insignifica*, Beth. Baker, Nov. Zool. xiii, p. 201 (1906).

B. Vertex of head of male normal.

a. (*Floccifera*). Abdomen of male with large sublateral tufts of flocculent hair from base.

1938. ELYDNA ERIGIDA.

Aletia erigida, Swinh. Trans. Ent. Soc., 1890, p. 221.

Caradrina crenulata, Beth. Baker, Nov. Zool. xiii, p. 202 (1906).

b. Abdomen of male without sublateral tufts of long hair from base.

a¹. Hindwing of male with the costal area on underside clothed with rough downturned scales with thicker ridge of scales along subcostal nervure.

- a*². Hindwing of male on underside with ridge of scales on medial part of vein 1, covered by a thick fringe of hair from inner margin.

1874a. ELYDNA BIPUNCTA.

Cosmia bipuncta, Snell. Veth's. Midden. Sumatra Lep. 44, 1880.

Graphiphora stellata, Moore, Lep. Atk. p. 119 (1882).

Caradrina lophophora, Hmps., Trans. Ent. Soc., 1895. p. 299; id. Moths, Ind. iv., p. 512.

Caradrina pratti. Beth. Baker, Nov. Zool. xiii., p. 202 (1906).

- b*². (*Dadica*). Hindwing of male with the inner area normal.

1877. ELYDNA LINEOSA.

- b*¹. Fore and hindwings of male with the medial part of termen excised.

1877a. ELYDNA TRUNCIPENNIS.

Elydna truncipennis, Hmps., Cat. Lep. Phal. B. M., ix., p. 168. (1910).

Head and thorax whitish suffused with pale rufous, the head rather whiter; palpi black, whitish at tips and in front; tarsi blackish ringed with white; abdomen greyish suffused with fuscous brown. Forewing pale rufous with slight dark irroration, the terminal area rather darker; subbasal line blackish, straight from costa to submedian fold in which there is a black point beyond it and a white point in cell further from base, antemedial line blackish, erect, slightly bent inwards to costa and incurved below submedian fold; orbicular represented by a black point, the reniform by a small yellowish white spot usually with white point above it and two minute points below it; a diffused dark medial line, oblique from costa to median nervure, then incurved; postmedial line blackish, slightly bent inwards to costa and incurved below vein 3, with minute black streaks beyond it on the veins; subterminal line indistinct, brown, slightly incurved between veins 6 and 4; a fine dark terminal line; cilia fuscous brown with a fine whitish line at base. Hindwing whitish suffused with brown especially on the veins and terminal area; cilia whitish with a brownish line near base from apex to vein 2; the underside with the costal area irrorated with brown, a small discoidal spot, postmedial series of slight black streaks on the veins and traces of a postmedial line towards costa.

Habitat.—JAPAN; COREA; N. CHINA; W. CHINA; PUNJAB, Kulu, Sultanpur; SIKKIM; ASSAM, Khasis; CEYLON, Pundaluoya, *Exp.* 28-34 mill.

- c*¹. (*Elydna*) Wing of male normal.

- a*². Forewing grey brown.

- a*³. Forewing with the postmedial line minutely
dentate *ochreipuncta*.

- b*³. Forewing with the postmedial line not dentate.

- a*¹. Forewing with series of black points on the veins beyond postmedial line *renalis*.
*b*¹. Forewing with series of short black streaks on the veins beyond postmedial line *rectilinea*.
*b*¹. Forewing with the ground colour ochreous yellow or red brown.
*a*¹. Forewing with blackish patches on costa at middle and before apex *bisignata*.
*b*². Forewing without blackish patches on costa.
*a*¹. Forewing with the postmedial line minutely waved and excurved beyond the cell.
*a*³. Forewing with black discoidal spot *atripuncta*.
*b*³. Forewing without black discoidal spot *ochracea*.
*b*⁴. Forewing with the postmedial line not waved, angled at vein 6, then oblique *transversa*.
1869. ELYDNA OCHREIPUNCTA.
 1878. ELYDNA RENALIS.
 1878a. ELYDNA RECTILINEA.
Elydna rectilinea, Hmps. Cat. Lep. Phal. B. M. ix., p. 172, pl. 141, f. 17 (1910).

Head and thorax whitish tinged with rufous, the head rather white; palpi fuscous, white at tips and in front; tarsi fuscous ringed with white; abdomen grey tinged with brown. Forewing pale grey tinged with pale reddish brown; subbasal line slight, dark, straight, from costa to submedian fold; antemedial line blackish, oblique, straight or slightly incurved in submedian interspace, slightly bent inwards to costa; orbicular represented by a minute dark point, the reniform by some white scales; a diffused dark medial shade oblique from costa to lower angle of cell, then blackish; postmedial line blackish, erect, straight, slightly bent inwards to costa, with minute black streaks beyond it on the veins; subterminal line indistinct, dark, rather diffused, excurved below vein 7 and at middle; a fine brown terminal line with minute white points at the veins; cilia grey-brown with a slight yellowish line at base. Hindwing whitish suffused with brown; a fine brown terminal line; cilia whitish with the yellowish line at base; the underside white, the marginal areas irrorated with brown, a brown discoidal lunule, diffused sinuous subterminal line and terminal series of black striae.

Habitat.—PUNJAB, Kulu, Sultanpur, Dalhousie. *Exp.* 32 mill.

2058a. ELYDNA BISIGNATA.

2058b. ELYDNA ATRIPUNCTA.

Elydna atripuncta, Hmps. Cat. Lep. Phal. B. M. ix., p. 175, pl. 141, f. 21 (1910).

♀. Head white, the palpi, frons, and antennæ except at base dark

brown; thorax white tinged with ochreous and irrorated with a few black scales; tibiae and tarsi brown; abdomen whitish dorsally tinged with ochreous and irrorated with a few dark scales except at base. Forewing white tinged with ochreous and irrorated with black scales, the terminal area tinged with rufous; antemedial line brown, double on inner area, oblique towards costa, then waved, angled outwards at vein 1; a round black discoidal spot; postmedial line brown, excurved and minutely waved to vein 2, angled inwards in submedian fold to near antemedial line and outwards on vein 1; subterminal line brown, diffused, oblique from costa to vein 7, incurved at discal and submedian folds; a series of small black spots before termen; cilia ochreous with a series of fuscous points. Hindwing whitish suffused with ochreous yellow especially on terminal area; the underside whitish, the costal and terminal areas irrorated with brown, a small discoidal spot.

Habitat.—CEYLON, Puttalam. *Exp.* 36 mill.

2058. ELYDNA OCHRACEA.

2057. ELYDNA TRANSVERSA.

Genus ANDROLYMNIA.

Type.

Androlymnia, Hmps. Cat. Lep. Phal. B. M. ix., p. 179

(1910) *emarginata*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and slenderly scaled, the 3rd long; frons smooth, with large tuft of hair above; eyes large, round; antennae of male somewhat laminate and almost simple; thorax clothed chiefly with scales, the prothorax with ridge-like crest, the metathorax with spreading crest; tibiae moderately fringed with hair; abdomen with dorsal crest at base only. Forewing typically with the apex produced and acute, the termen excised below apex and excurved at middle, the inner margin with antemedial lobe and scale tooth; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from first below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2098. ANDROLYMNIA EMARGINATA.

Genus NICARA.

Type.

Nikara, Moore, Lep. Atk., p. 126 (1882) *castanea*.

Proboscis fully developed; palpi upturned, short, the 2nd joint broadly scaled, the 3rd minute; frons smooth; eyes large, round; antennae of male minutely ciliated; thorax clothed almost entirely with scales and without crests. Forewing rather short and broad, the apex rounded, the termen obliquely curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11

from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1792. NICARA CASTANEA.

Genus APOCALYMNIA.

Type.

Apocalymnia, Hmps. Cat. Lep. Phal. B. M., ix, p. 184

(1910) *tenebrosa*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching about to middle of frons and moderately scaled, the 3rd short; frons with large corneous process with raised edges; eyes large, round; antennæ of female laminate; head and thorax clothed almost entirely with scales, the prothorax without crest, the metathorax with slight crest; tibiæ moderately fringed with hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen slightly waved and somewhat excised towards tornus; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1874c. APOCALYMNIA TENEBROSA.

Genus CALYMNIA.

Type.

Calymnia, Hübn. Verz., p. 235 (1827) *trapezina*.

Eustegnia, Hübn. Verz., p. 236 (1827) *diffinis*.

Euperia, Guen. Ann. Soc. Ent. Fr., 1839, p. 486 *trapezina*.

A. Forewing with the postmedial line obliquely down curved from costa to vein 6.

a. Forewing with wedge-shaped white patch on costa at postmedial line *restituta*.

b. Forewing without wedge-shaped white patch on costa at postmedial line *flavifimbria*.

B. Forewing with the postmedial line oblique from costa to vein 6 *ochreimargo*.

2055. CALYMNIA RESTITUTA.

Cosmia restituta, Wlk., x, 490 (1856).

Calymnia picta, Stand. Stett. Ent. Zeit., 1888, p. 257, id., Rom. Mem., vi, p. 503, pl. 10, f. 2.

2056. CALYMNIA FLAVIFIMBRIA.

Cosmia affinis, Hmps., Moths. Ind., ii, p. 321 part. (nec. Linn.).

Calymnia flavifimbria, Hmps., Cat. Lep. Phal. B. M., ix, p. 193, pl. 141, f. 27 (1910).

1873. CALYMNIA OCHREIMARGO.

Genus BASILICA.

Type.

Basilica, Hmps. n., Cat. Lep. Phal. B. M., ix., p. 209 (1910) *chrysosticta*.
2689a. BASILICA CHRYSOSTICTA.

Genus MUDARIA.

Type.

Mudaria, Moore, Indian Museum, Notes iii, p. 68 (1893) *cornifrons*.
1825. MUDARIA CORNIFRONS.

Genus PHRAGMATIPHILA.

Type.

Nonagria, Hübn. Verz., p. 241 (1827), Nec. Treit., 1825. . . . *typhæ*.
Phragmatiphila, Hmps. n., Cat. Lep. Phal. B. M., ix., p. 266 (1910). *neva*.

Proboscis aborted, minute; palpi porrect, hardly extending beyond the frons and fringed with long hair below; frons with transverse corneous plate at middle, square in front and concealed by hair; eyes large, round; antennæ of male typically serrate and fasciculate; thorax clothed with hair only, the pro and metathorax with slight spreading crests; tibiæ fringed with long hair; abdomen with some rough hair at base and dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 9 from 10 anastomosing with 8 to form a rather long areole; 6 from the areole or cell; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 on a long stalk; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male minutely serrate and fasciculate.

1978a. PHRAGMATIPHILA FUMEA.

Sect. II.—Antennæ of male ciliated.

A. Forewing with the small reniform with dark centre and pale annulus open above and below . . . *leucaneura*.

B. Forewing with the reniform a pale lunule . . . *grisea*.

1978b. PHRAGMATIPHILA LEUCANEURA.

Phragmatiphila leucaneura, Hmps. n., Cat. Lep. Phal. B. M., ix., p. 269, pl. 143, f. 1. (1910).

♂. Head and thorax dark brown, the scales tipped with grey; pectus and legs dark brown mixed with greyish, the tarsi blackish ringed with white; abdomen greyish suffused and irrorated with dark brown. Forewing greyish ochreous strongly suffused and irrorated with dark brown, the veins of costal area with slight pale streak; traces of a curved blackish ante-medial line; orbicular and reniform very small, ochreous, defined by black except above and with some black before and between them, the former rather triangular, the latter with black striga in centre; traces of an oblique blackish medial line from lower angle of cell to inner margin; an oblique postmedial series of slight black points on the veins from vein 6 to inner

margin; an oblique, ochreous shade from apex; an oblique ochreous line from termen just below apex to inner margin, fine towards apex and broadening towards inner margin, defined on each side by dark brown suffusion; a terminal series of black points; cilia ochreous tipped with brown. Hindwing ochreous suffused with brown, the base and termen paler; the underside ochreous irrorated with brown, the terminal half suffused with brown, a dark discoidal spot.

Habitat.—BURMA, Hsipaw. *Exp.* 26 mill.

1798c. *PHRAGMATIPHILA GRISESCENS*.

Phragmatiphila grisezens, Hmps., Cat. Lep. Phal. B. M. ix.
p. 270, pl. 143, f. 2 (1910).

♀. Head and thorax grey tinged with dull brown; pectus, legs and abdomen suffused with fuscous. Forewing grey tinged with brown and irrorated with fuscous, the cell and area just below it suffused with fuscous, the terminal area suffused with fuscous narrowing to a point at apex; traces of a blackish antemedial line bent inwards to costa and excurved in cell and submedian interspace; reniform a small ochreous lunule defined by black; traces of an oblique waved medial line from cell to inner margin; traces of a blackish postmedial line, oblique towards costa, then with series of black points beyond it on the veins, excurved to vein 4, then oblique; a terminal series of minute black lunules defined on inner side by slight ochreous lunules. Hindwing greyish suffused with fuscous brown; the underside brownish white irrorated with brown, a small dark discoidal spot.

Habitat.—SIKIM, 1,800'. *Exp.* 34 mill.

Genus CALAMISTIS.

Type.

Calamistis, Hmps. Cat. Lep. Phal. B. M. ix., p. 273 (1910) .. *fusca*.

Proboscis aborted, minute; palpi upturned, the 2nd joint reaching to middle of frons and fringed with long hair in front, the 3rd short; frons smooth; eyes large, round; antennæ of male typically bipectinate with moderate branches to apex; thorax clothed with long hair and hair-like scales, the pro- and metathorax with spreading crests; tibiæ fringed with long hair; abdomen with dorsal crest at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

Sect. I.—Antennæ of male bipectinate with moderate branches to apex.

1942a. *CALAMISTIS PRÆPALLENS*.

Calamistis præpallens, Hamps., Cat. Lep. Phal. B. M. ix,
p. 275, pl. 143, f. 7 (1910).

♂. Head and thorax fuscous brown tinged with grey; hind legs whitish; abdomen white, slightly tinged with brown. Forewing grey-brown, the costal half paler; a diffused pale rufous fascia in discal fold from middle of cell to subterminal line; a black streak below basal half of cell; orbicular represented by a black point above median nervure, the reniform by a small fuscous spot at lower angle of cell slightly defined by white, its upper part defined by slight black points; a rather wedge-shaped black subterminal spot in discal fold with traces of black points on the veins from it to inner margin; a terminal series of slight black striae. Hindwing white with fine dark terminal line; the underside with the costal area and terminal area to vein 3 tinged with pale rufous.

Habitat.—TRAVANCORE, Pirmad. *Exp.* 30 mill.

Sect. II.—Antennæ of male ciliated.

A. Forewing with the inner half pale to subterminal line *microsticta*.

B. Forewing with the basal half of inner area concolorous *submarginalis*.

1793. CALAMISTIS MICROSTICTA.

1946. CALAMISTIS SUBMARGINALIS.

Genus RABILA.

Type.

Rabila, Wlk., xxxii., 507 (1865) *frontalis*.

1591. RABILA FRONTALIS.

Genus ARENOSTOLA.

Type.

Arenostola, Hmps. Cat. Lep. Phal. B. M. ix., p. 281 (1910). *phragmitidis*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head and moderately fringed with hair in front, the 3rd short, porrect; frons smooth, with tuft of hair; eyes large, round; antennæ of male ciliated; thorax clothed with hair and hairlike scales, the prothorax with slight spreading crest, the metathorax without crest; tibiæ moderately fringed with hair; abdomen without crests. Forewing with the apex somewhat produced and acute, the termen evenly curved and hardly crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1942b. ARENOSTOLA PROCERA.

Tapinostola procera, Staud. Stett. Ent. Zeit. 1889, p. 47; Hmps.

Cat. Lep. Phal. B. M. ix, p. 286, pl. 143, f. 19; Staud, Cat.

Lep. pal., p. 189.

Head and thorax ochreous white mixed with brown; palpi and legs brownish; abdomen ochreous white tinged with brown. Forewing ochreous white tinged with pale rufous and rather thickly irrorated with

fuscous brown, the veins slightly streaked with brown; traces of a post-medial series of dark points on the veins, excurved to vein 4, then oblique; a terminal series of brown striæ. Hindwing white tinged with ochreous; the underside with the costal area and terminal area to vein 2 irrorated with brown.

Habitat.—W. TURKESTAN; E. TURKESTAN; MONGOLIA; KASHMIR, Numbra. *Exp.* 30-34 mill.

Genus SPHETTA.

Type.

Sphetta, Wlk., xxxii., 457 (1865) *apicalis*.
1585. SPHETTA APICALIS.

Genus. ACRAPEX.

Type.

Acrapev, Hmps. Moths Ind. ii, p. 286 (1894) *prisca*.
Acutipenna, Hmps. Moths Ind. ii, p. 287 (1894) *acuminata*.

Sect. I. (Acutipenna)—Antennæ of male annulated and ciliated.

1954. ACRAPEX ACUMINATA.

Sect. II. (Acrapev)—Antennæ of male ciliated and not annulate.

A. Forewing with hooked white mark above median nervure in lower extremity of cell *hamulifera*.

B. Forewing without hooked white mark above median nervure.

a. Forewing with dark shade along median nervure.

a¹. Forewing with pale streaks on the veins of costal area only *brunnea*.

b¹. Forewing with pale streaks on all the veins.

a². Head and tegulæ black. *atriceps*.

b². Head and tegulæ not black.

a³. Forewing ochreous white tinged with fuscous brown *leucophlebia*.

b³. Forewing pale pinkish rufous *prisca*.

b. Forewing without dark shade along median nervure *roseotincta*.

1952. ACRAPEX HAMULIFERA.

1952a. ACRAPEX BRUNNEA.

Acrapev brunnea, Hmps. Cat. Lep. Phal. B. M. ix., p. 318, pl. 144, f. 11 (1910).

Head and tegulæ dark brown slightly mixed with ochreous; thorax ochreous tinged with rufous; pectus and legs ochreous mixed with brown; abdomen ochreous suffused with brown. Forewing ochreous, the costal area suffused with red-brown leaving slight pale streaks on the veins; a diffused brown streak along median nervure and thence to the subterminal oblique fascia, with two white points on it at lower angle of cell; a slight brown streak below base of cell; an oblique pale fascia from apex to discal fold, with a diffused brown fascia below it from termen below apex to vein 3,

with minute black streaks on it in the interspaces; a terminal series of slight black lunules; cilia ochreous mixed with brown and with brown line near base. Hindwing ochreous white, the veins and terminal area tinged with brown; a fine brown terminal line; cilia whitish with a slight brown line near base; the underside whitish with the costal and terminal areas irrorated with reddish brown.

Ab. 1.—Hindwing more uniformly tinged with brown.

Ab. 2.—Forewing without the white points at lower angle of cell.

Habitat.—BR. E. AFRICA; UGANDA; MASHONALAND; GAZALAND; TRANSVAL; NATAL; CEYLON, Maskeliya; BORNEO, Pulo Laut; BR. N. GUINEA; QUEENSLAND; S. AUSTRALIA. *Exp.* 20-30 mill.

1951b. *ACRAPEX ATRICEPS*.

Acrapex atriceps, Hmps. Cat. Lep. Phal. B. M. ix., p. 319, pl. 144, f. 13 (1910).

♂. Head and tegulæ black; thorax ochreous tinged with rufous; with a black dorsal stripe; pectus and legs dark brown, the hind tibiæ and tarsi ochreous above; abdomen ochreous. Forewing pale ochreous slightly tinged with rufous, the veins defined by brown streaks except on inner area beyond the oblique subapical fascia, the costal edge black-brown: a diffused brown mark at lower angle of cell with white points in and beyond the angle defined by some black scales; an oblique brown fascia from termen below apex to vein 3 where it is diffused inwards to lower angle of cell; a terminal series of black striæ; cilia with black line at middle and mixed with black at tips. Hindwing ochreous white slightly tinged with red-brown; cilia ochreous white with a faint brown line at middle; the underside whitish slightly irrorated with brown, the costal area suffused with brown.

Habitat.—ASSAM, Khasis. *Exp.* 26 mill.

1953. *ACRAPEX LEUCOPHLEBIA*.

1951. *ACRAPEX PRISCA*.

1951c. *ACRAPEX ROSEOTINCTA*.

Acrapex roseotincta, Hmps. Cat. Lep. Phal. B. M. ix., p. 320, pl. 144 f. 16 (1910).

♀. Head and thorax ochreous tinged with brown; abdomen ochreous white. Forewing pale ochreous yellow faintly tinged with rufous and the veins slightly streaked with rufous; a slight blackish streak below basal half of cell; some black scales at lower angle of cell; an oblique postmedial veins of black points on veins 6 to 1; an oblique diffused rufous fascia from termen below apex to vein 3; a slight brown terminal line cilia yellowish white with a faint brownish line through them. Hindwing white faintly tinged with ochreous; the underside white with the costal area tinged with ochreous.

Habitat.—CEYLON, Maskeliya. *Exp.* 22 mill.

Genus SESAMIA.

Type.

Sesamia, Guen. Noct. i., p. 95 (1852) *vuteria*.

Microsemyra, Butl. P. Z. S. 1883, p. 155 *pallida*.

Sect. I.—Antennæ of male bipectinate with extremely short branches, the apex serrate.

A. (Microsemyra), Hindwing with veins 3·4 strongly stalked in male from cell in female.

1950. *SESAMIA PALLIDA*.

B. Hindwing with veins 3·4 from cell in both sexes.

1943. *SESAMIA INFERENS*.

Leucania inferens, Wlk. ix. 105 (1856); Moore, Lep. Ceyl. iii, p. 8, pl. 145, f. 3.

„ *proscripta*, Wlk. ix. 106 (1856).

Sesamia albiciliata, Snell, Tijd. v. Ent. xxiii., p. 44, pl. 4, f. 3 (1880).

„ *tranquillaris*, Butl. P. Z. S. 1880, p. 674.

Nonagria gracilis, Butl. P. Z. S. 1880, p. 675.

„ *innocens*, Butl. Trans. Ent. Soc. 1881, p. 173.

Sect. II.—Antennæ of male with fasciculate cilia.

A. Forewing ochreous slightly tinged with rufous .. *cretica*.

B. Forewing ochreous slightly tinged with olive .. *uniformis*.

1943a. *SESAMIA CRETICA*.

Leucania hesperica, Frr. Neue Beitr vi, p. 32, pl. 501, f. 2 (1852).
nec. Rmbr.

Sesamia cretica, Led. Noct. Eur., p. 225 (1857); Staud. Cat. Lep. pal. p. 190.

Nonagria cyræa, Mab. Ann. Soc. Ent. Fr. 1866, p. 559, pl. 8, f. 7 and 1867, p. 640, pl. 14, f. 1.

Sesamia fraterna, Moore, Lep. Atk. p. 103 (1882).

„ *striata*, Staud. Stett. Ent. Zeit. 1888, p. 27.

Head and thorax pale ochreous tinged with rufous; palpi, sides of frons and fore femora above brownish; abdomen ochreous white; forewing pale ochreous tinged with rufous especially on terminal half, the veins with slight pale streaks; faint fuscous streaks above and below extremity of median nervure, and beyond the cell above and below vein 4; sometimes with slight antemedial dark point in submedian fold and postmedial series of points on the veins with points before them in discal and submedian folds; a fine brown terminal line; cilia ochreous tinged with rufous and with fine pale lines at base and middle. Hindwing pure white.

Ab. 1.—*striata*. Forewing with dark streak below base of cell and streaks; on the veins of terminal area . . Asia Minor, Syria, W. Turkestan.

Habitat.—CORSICA ; CENTR. ITALY ; DALMATIA ; CRETE ; EGYPT ; SUDAN ; BASUTOLAND ; ADEN ; ASIA MINOR ; SYRIA ; W. TURKESTAN ; PUNJAB, Kangra, Dharmasala ; SIKKIM. *Exp.* 30-42 mill.

Larva, Kirby, Eur. Butt. and Moths, p. 166; Hfm. Raup., p. 105.

Ochreous whitish ; head rufous ; spiracles black. Foodplant, in stalks of maize.

1943*b*. SESAMIA UNIFORMIS.

Nonagria uniformis, Dudgeon, J. Bomb. N. H. Soc. xvi, p. 402 (1905).

Head and thorax pale ochreous slightly tinged with brown ; palpi fuscous, whitish below ; frons tinged with fuscous ; fore and mid legs irrorated with fuscous ; abdomen ochreous white. Forewing olive ochreous sparsely irrorated with dark brown ; an antemedial black point in submedian fold ; a slight diffused fuscous shade on extremity of median nervure and just beyond lower angle of cell ; a slight black point in lower angle of cell and another in discal fold just beyond the discocellulars ; postmedial black points in discal and submedian folds with races of a curved series of black points beyond them on the veins ; a fine blackish terminal line not quite reaching apex and tornus ; cilia ochreous white with faint brownish lines near base and tips. Hindwing pure white ; the underside with the costal area slightly tinged with ochreous and irrorated with brown.

Habitat.—BENGAL, Burogah ; BOMBAY, Surat. *Exp.* ♂ 32, ♀ 34-38 mill.

Larva. Destructive to sugar-cane.

Genus XYLOSTOLA.

Type.

Xylostola, Hmps. n., Cat. Lep. Phal. B. M., ix, p. 335 (1910).. *indistincta*.

Proboscis fully developed ; palpi upturned, the 2nd joint reaching about to vertex of head and broadly fringed with scales in front, the 3rd long ; frons with small rounded prominence covered by a tuft of hair ; eyes large, round ; antennæ of male ciliated ; thorax clothed with hair and hair-like scales, and without crests ; tibiæ fringed with rather long hair ; abdomen with some rough hair at base, but without crests. Forewing with the apex rather produced and acute, the termen evenly curved and hardly crenulate ; veins 3 and 5 from near angle of cell ; 6 from upper angle ; 9 from 10 anastomosing with 8 to form the areole ; 11 from cell. Hindwing with veins 3·4 from angle of cell ; 5 obsolescent from just below middle of discocellulars ; 6·7 from upper angle ; 8 anastomosing with the cell near base only.

A. Forewing with black lunules in centre and on outer edge of reniform.. .. *robusta*.

B. Forewing with the reniform defined by black points *indistincta*.

1945. XYLOSTOLA ROBUSTA.

1889. XYLOSTOLA INDISTINCTA.

Genus ARCILASISA.

Type.

Arsilasisa, Wlk., xxxii., 470 (1865) *sobria*.
1939. ARSILASISA SOBRIA.

Genus CLETHRORASA.

Type.

Clethrorasa., Hmps., Cat. Lep. Phal. B. M., ix., p. 343
(1910) *pilcheri*.

Proboscis fully developed ; palpi upturned, the 2nd joint smoothly scaled and flattened against the frons, the 3rd short ; frons smooth, eyes large, round ; antennæ of male almost simple ; thorax clothed almost entirely with scales and without crests ; tibiæ smoothly scaled ; abdomen with dorsal crests on basal segments. Forewing narrow, the margins subparallel, the apex rounded, the termen evenly curved and not crenulate ; veins 3 and 5 from near angle of cell ; 6 from upper angle, 9 from 10 anastomosing with 8 to form the areole, 11 from cell. Hindwing with veins 3·4 from angle of cell ; 5 obsolescent from just below middle of discocellulars ; 6·7 from upper angle ; 8 anastomosing with the cell near base only.

1960a. CLETHRORASA PILCHERI.

Genus. APSARASA.

Type.

Apsarasa, Moore, P. Z. S., 1867., p. 665 *radians*.

A. Hindwing with the white patch extending almost
to cell *radians*.

B. Hindwing with irregular white patch on termen.. *figurata*.

1962. APSARASA RADIAN.

1962a. APSARASA FIGURATA.

Apsarasa figurata, Moore, P. Z. S., 1877, p. 604 ; Hmps., Cat. Lep.
Phal. B. M., ix., p. 347., pl. 144, f. 32.

♀. Head and thorax blue-black ; palpi with white spot on basal joint in front ; frons with yellowish white patch above ; vertex of head and tegulæ at middle and tips with yellowish white bands ; pro- and meso-thorax with yellowish spots and meta-thorax with yellowish patch ; coxæ with white patches ; femora at extremities, tibiæ and tarsi, with white bands ; abdomen black-brown tinged with metallic blue, the two basal segments with yellowish white dorsal spots. Forewing blue-black, the costal terminal and inner areas with yellowish white patches leaving radiating blue-black bars and streaks ; the costal area with three small yellowish white spots on costal area followed by an oblique striga, then an erect striga, and irregular medial patch, a slight bar above end of cell followed by a striga, a triangular patch towards apex followed by an oblique bar and triangular patch at apex ; the terminal area with two short oblique streaks towards apex with point before the

upper one, a minute streak at vein 5 and four oblique triangular patches between vein 4 and tornus; the inner area with small triangular antemedial spot followed by a striga, a broad medial band from submedian fold to inner margin extending to just above the fold at extremity, followed by a wedge-shaped spot, then a narrow bar and wedge-shaped spot towards tornus; a yellowish white point at middle of cell and another at upper angle. Hindwing black-brown with some white on termen between vein 4 and tornus, its inner edge very irregular and angled inwards below veins 4 and 3; the underside with antemedial white spot on costa, slight streak in base of cell, some whitish below base of cell, faint medial band from costa to discal fold, slight postmedial spots below costa and vein 8, two short subapical streaks and slender elongate streaks above and below discal fold.

Habitat.—ANDAMANS. *Exp.* 46-50 mill.

Genus CHASMINA.

Type.

Chasmina, Wlk., ix, 146 (1856). *tibialis*.

Sphragifera, Staud, Rom. Mén. vi, p. 544 (1892) *sigillata*.

Clinophlebia, Hmps., Ill. Het. B. M., ix, p. 92 (1893) *sericea*.

Sect. I. (Clinophlebia).—Forewing of male with the apex rectangular, the costa somewhat excised beyond middle and the costal neuration slightly distorted.

1957. CHASMINA SERICEA.

Sect. II (Chasmina).—Forewing with the apex rounded, the costa not excised, the neuration normal.

A. Forewing without subapical or postmedial dark patches.

a. Forewing without postmedial line *tibialis*.

b. Forewing with postmedial line *judicata*.

B. Forewing with sinuous dark patch from costa before apex *rejecta*.

C. Forewing with elliptical rufous patch in and beyond end of cell *maculata*.

1958. CHASMINA TIBIALIS.

Noctua tibialis, Fabr, Syst. Ent., p. 578 (1775).

Leocyma vestæ, Guen., Noct. ii, p. 213 (1852).

„ *dianæ*, Guen., Noct. ii, p. 213 (1852).

Chasmina cygnus, Wlk., ix, 147 (1856); Butl., Ill. Het. B. M., vi, p. 35, pl. 110, f. 3.

„ *glabra*, Wlk., xxxii, 636 (1865).

Xanthodes, mariæ, Mab., C. R. Ent. Soc. Belg., xxv., p. 1x (1884).

1959. CHASMINA JUDICATA.

1960. CHASMINA REJECTA.

Noctua rejecta, Fabr., Syst. Ent., p. 601 (1775).

Acontia limacula, Wlk., xii, 796 (1857); Butl., Ill. Het. B. M., iii, p. 20, pl. 45, f. 8.

Chasmina stigmata, Hmps., Ill. Het. B. M., viii, p. 73, pl. 145, f. 10. (1891).

1961. CHASMINA MACULATA.

Genus CALLYNA.

Type.

- Callyna*, Guen., Noct., i, p. 112 (1852) *siderea*.
 A. Abdomen with the terminal segments orange .. *siderea*.
 B. Abdomen with the terminal segments not orange.
 a. Forewing with ante and postmedial black patches
 on costa *costiplaga*.
 b. Forewing without ante and postmedial black
 patches on costa.
 *a*¹. Forewing with dark fascia in discal fold be-
 tween postmedial and subterminal lines.
 a. Forewing with the claviform represented by
 a small black spot *jugaria*.
 *b*². Forewing with the claviform absent.
 *a*³. Forewing with the postmedial line dentate
 from costa to vein 4 *semivitta*.
 *b*³. Forewing with the postmedial line oblique
 and straight from costa to vein 4. .. *mystica*.
 *b*¹. Forewing without dark fascia in discal fold be-
 tween postmedial and subterminal lines .. *monoleuca*.

2169. CALLYNA SIDEREA.

2173. CALLYNA COSTIPLAGA.

2171. CALLYNA JUGARIA.

2171*a*. CALLYNA SEMIVITTA.

Callyna semivitta, Moore, Lep. Atk., p. 161 (1882); Waterh.
 Aid. ii., pl. 160, f. 3.

♀. Head deep chocolate brown mixed with some white; palpi with the 1st and 2nd joints white in front; thorax chocolate-red, the tegulae white at base; pectus and legs brown mixed with white, the tibiae and tarsi ringed with white; abdomen grey-brown, the ventral surface irrorated with white. Forewing chocolate red with a purple gloss, irrorated with a few white scales, the base and the area below the costa and the upper part of cell thickly irrorated with ochreous white to the postmedial line; subbasal line indistinctly double filled in with white, waved from costa to submedian fold; antemedial line defined on each side by ochreous white, waved, interrupted, obsolete below submedian fold, an oblique white striga before it across the cell; orbicular and reniform with white annuli defined by black, the former with some ochreous scales in centre, its outer edge produ-

ced to a streak connected with the reniform, which has an ochreous centre, narrow, rather constricted at middle and slightly angled inwards on median nervure; postmedial line double filled in with ochreous white, irregularly waved, oblique from costa to vein 4, below vein 3 represented by white points on the veins, a black-brown fascia from it to subterminal line in discal fold; some white points on postmedial part of costa; an apical ochreous white patch extending on to the cilia at apex and with dark striæ on it at termen and dark wedge-shaped mark before it below costa; the subterminal line represented by an excurved ochreous white mark below the apical patch and two points in discal fold, then very faint, incurved below vein 3 and with slight dark mark on it at submedian fold; a terminal series of white points. Hindwing fuscous brown with a cupreous gloss; the cilia greyish intersected with white at the veins and tipped with white between veins 6 and 4; the underside brown irrorated with white, especially on basal half, the inner area greyish, a brown discoidal lunule and diffused medial band, some white on termen between veins 2 and 1.

Habitat.—PUNJAB, Kulu; SIKKIM. *Exp.* 48-66 mill.

2172. *CALLYNA MYSTICA*.

2170. *CALLYNA MONOLEUCA*.

Callyna monoleuca, Wlk. xv., 1667 (1858).

Leocyma apicalis, Snell. Tijds. v., Ent. xxiii, p. 54, pl. 4, f. 9 (1880).

Genus SEUDYRA.

Type.

Seudyra, Stretch, Cist. Ent. ii, p. 19 (1875) *transiens*.

Sect. I.—Palpi with the 3rd joint long; midwing with the termen slightly excised at submedian fold and the tornus lobed.

1571. *SEUDYRA VENOSA*.

Sect. II.—Palpi with the 3rd joint moderate; hindwing with the termen evenly curved.

A. Forewing with the apex produced, the termen obliquely curved.

a. Hindwing without discoidal spot *longipennis*.

b. Hindwing with black discoidal spot *catocalina*.

1572. *SEUDYRA LONGIPENNIS*.

1573. *SEUDYRA CATOCALINA*.

Phægorista catocalina, Wlk., xxxv. 1859 (1866); Butl. Ill. Het.

B. M. v., p. 20, pl. 82, f. 9; Kirby, Cat.

Lep. Het., p. 38.

Zalissa exigrifascia, Swinh., Cat. Het. Mus. Oxon. 1, p. 167 (1892).

B. Forewing with the apex not produced, the termen much less obliquely curved.

a. Both wings with the termen not crenulate.

- a*¹. Hindwing with the terminal band expanding into a large quadrate patch above tornus .. *bala*.
*b*¹. Hindwing with the terminal band not expanding into a large quadrate patch above tornus .. *transiens*.

1570. SEUDYRA BALA.

1569. SEUDYRA TRANSIENS.

Eusemia transiens, Wlk., vii. 1588 (1856); Kirby, Cat. Lep. Het. p. 38.

Phagorista catocaloides, Wlk., Journ. Linn. Soc. Zool., vi, p. 87 (1862).

Agarista egocerooides, Feld. Reis. Nov., pl. 107, f. 10 (1878).

Seudyra dissimilis, Swinh. Trans. Ent. Soc., 1890, p. 174.

- b*. Both wings with the termen crenulate.

a. Forewing with curved white patch beyond the cell *albifascia*.

b. Forewing with quadrate white spot in end of cell *nepcha*.

1574. SEUDYRA ALBIFASCIA.

1575. SEUDYRA NEPCHA.

Genus. PROTOSEUDYRA.

Type.

Protoseudyra, Hmps., Cat. Lep. Phal. B. M., ix, p. 443.

(1910) *picta*.

Proboscis fully developed; palpi porrect, extending about the length of head, the 2nd joint moderately fringed with hair below, the 3rd short; frons with rounded prominence with minute pointed corneous process at middle; eyes large, round; antennæ of male ciliated; thorax clothed with hair and hair-like scales and without crests; fore tibiæ fringed with long hair: the mid and hind tibiæ moderately fringed with hair; abdomen with very large crest of curled metallic scales at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1872. PROTOSEUDYRA PICTA.

Genus OPSYRA.

Type.

Opsyra, Hmps., Cat. Lep. Phal. B. M. ix, p. 445 (1910) .. *chalcoela*.

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching about to vertex of head and moderately fringed with scales in front, the 3rd short, porrect; frons smooth; eyes large, round; antennæ of

male minutely ciliated; thorax clothed chiefly with scales, the pro and metathorax with spreading crests of very long spatulate scales, the patagia fringed with long rough scales at extremity; tibiæ fringed with rather long hair; abdomen with large crest at base only. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from just below middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2174a. OPSYRA CHALCOELA.

Genus MICRAPATETIS.

Type.

Micrapatetis, Meyr., Trans. Ent. Soc. 1897, p. 369 . . . *orthozona*.

Axiorata, Turner, P. Linn. Soc. N. S. W. xxvii., p. 120 (1902). *leucozona*.

Proboscis fully developed; palpi upturned, the 2nd joint reaching to about vertex of head and moderately scaled, the 3rd short; frons with rounded prominence; eyes large, round; antennæ of male ciliated; thorax clothed almost entirely with scales, the prothorax without crest, the metathorax with large spreading crest; tibiæ slightly fringed with hair; abdomen without crests. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from below upper angle; 7. 8. 9. 10 stalked; 11 from cell. Hindwing with veins 3·4 shortly stalked; 5 obsolescent from middle of discocellulars; 6·7 from upper angle or stalked; 8 anastomosing with the cell to near middle.

A. Forewing ochreous suffused with purplish red . . . *pyrastis*.

B. Forewing dark red-brown with the basal area yellow . . . *flavipars*.

1962a. MICRAPATETIS PYRASTIS.

Micrapatetis pyrastis, Hmpsn., Cat. Lep. Phal. B. M., ix. p. 454, pl. 146., f. 22 (1910).

♀. Head and tegulæ purplish grey; thorax pale purplish red; palpi, pectus and legs blackish mixed with grey; abdomen purplish red. Forewing pale purplish red, the basal half with an ochreous tinge; a medial leaden grey band defined at sides by black lines, slightly constricted at discal fold and strongly at submedian fold, some slight pale points beyond it on costa; cilia whitish at base, blackish at tips. Hindwing fuscous with a purplish grey tinge; cilia whitish with a fuscous line through them; the underside rather paler with faint diffused curved postmedial line.

Habitat.—MADRAS, Gooty. *Exp.* 18 mill.

1962b. MICRAPATETIS FLAVIPARS.

Micrapatetis flavipars, Hmpsn., Cat. Lep. Phal. B. M., ix., p. 454 pl. 146, f. 23 (1910).

♀. Head and tegulæ dark greyish brown; thorax ochreous yellow

pectus, legs and abdomen greyish brown. Forewing with the basal area ochreous yellow defined by the fine black antemedial line, which is minutely waved and somewhat oblique, the base of costa with a brown fascia; the rest of wing dark red-brown with a silvery gloss; an indistinct diffused red-brown postmedial line. Hindwing reddish brown with a greyish tinge, a fine pale line at base of cilia.

Habitat.—BOMBAY. *Exp.* 18 mill.

Genus HYPOCALAMIA.

Type.

Hypocalamia, Hmps., Cat. Lep. Phal. B. M., ix., p. 495

(1910)

.. .. *meterythra*

Proboscis fully developed; palpi obliquely upturned, the 2nd joint reaching about to middle of frons and moderately fringed with scales in front, the 3rd short; frons smooth; eyes larger, round; antennæ of male ciliated; thorax clothed with hair only and without crests; tibiæ moderately fringed with hair; abdomen without crests. Forewing with the apex rounded, the termen evenly curved and not crenulate; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 obsolescent from middle of discocellulars; 6·7 from upper angle; 8 anastomosing with the cell near base only.

1709. HYPOCALAMIA METERYTHRA.

(To be continued.)

THE PALMS OF BRITISH INDIA AND CEYLON,
INDIGENOUS AND INTRODUCED

BY

E. BLATTER, S.J.

PART VII.

(With Plates XXXIII to XXXIX and text-figures 24 to 27.)

(Continued from page 391 of this Volume.)

COPERNICIA, Mart. Hist. Nat. Palm. III, 242, t. 49, 50
(excl. t. 50, A I—IV).

(After Nicolaus Copernicus, the famous astronomer, 1473-1543.)

Kunth, Enum. Pl. III, 343.—Griseb. Fl. Brit. W. Ind. 544.—
Benth. et Hook. f. Gen. Pl. III, 927 (excl. *Cryosophila*).—Becc.
in Webbia II (1907), 140.

Stem erect, mostly of considerable height, rarely low, annulate in the lower part, covered higher up with the bases of the persistent petioles. Leaves terminal, flabelliform. Petioles with strong spines and a ligule. Segments induplicate, often with fibres between the segments.

Spadices elongate-paniculate, much-branched, with several tubular spathes and superposed partial inflorescences, which are divided into several flower-bearing branchlets; each branchlet provided with a more or less tubular spathe or with a simple bract at the point of its origin. Flowers hermaphrodite, single or in clusters, sessile, bracteate or bracteolate. Calyx tubular, more or less deeply 3-dentate. Corolla more or less distinctly tubular below, divided in 3 valvate, narrow segments, which are strongly sculptured-alveolate on the inner side. Stamens 6; filaments united at the base with the corolla-tube and forming in the throat a 6-lobed or 6-dentate corona, suddenly restricted and subulate in the upper part, anthers ovate or oblong, dorsifixed. Ovary consisting of 3 carpels which are free below and united above into one common style; stigma tridenticulate.

Fruit globose or ovoid, formed by one carpel, with the rest of

the abortive carpels at the apex; endocarp crustaceous-woody, thin. Seed free in the endocarp; hilum basilar; albumen deeply ruminate; embryo basilar near the hilum.

Species about 9.

DISTRIBUTION.—Brazil, Venezuela, Argentine, S. Domingo, Cuba, New Granada.

COPERNICIA CERIFERA, Mart. Hist. Nat. Palm. III, 56, t. 49 et 50 (excl. fig. 10) et 242 (partim).—Becc. in Webbia, II (1907) 145—*Corypha cerifera*, Man. Arruda da Camara, in Koster Travels in Brazil (1816) App. (ex. Mart. l. c. 56).

NAMES.—Brazilian Wax Palm; Carnauba (in Brazil).

DESCRIPTION.—Stem 30-40 feet high, cylindric, erect, at the base usually slightly thickened, 6-8 inches in diameter, covered with the bases of fallen leaves, either in the upper part only or throughout. Leaves 4-6 $\frac{2}{3}$ feet long, forming a large spherical crown. Petiole 2-3 feet long with the base dilated, depressed, a little concave above and convex below, armed on the margins with stout, compressed spines; ligule glabrous, semiroundate-oblong, finely coriaceous; rhachis 0; limb suborbicular in outline, flabelliform-multifid, undivided in the central part for about 1-1 $\frac{1}{3}$ feet from the apex of the petiole and on the sides only for about $\frac{4}{5}$ -1 $\frac{1}{5}$ inches, thinly coriaceous, cereo-pulverulent or whitish on both surfaces, divided into about 60 segments; central segments 2 $\frac{2}{3}$ feet long from the apex of the petiole and about 1 $\frac{2}{5}$ inches wide where broadest.

Spadices much elongate, erect-patent, 5-6 feet long, thrice divided, composed of several partial inflorescences which are alternately superposed. Primary spathes elongate, tubular, cylindric (at least above where they measure about $\frac{1}{2}$ inch in diameter), finely striate lengthwise, glabrous, obliquely truncate at the mouth where the margin is entire or scarcely reticulate-fibrous, prolonged on one side into a triangular, acute, dorsally carinate point: partial inflorescences laxly paniculate-elongate; panicles divided into 6-7 branches, each arising from within a tubular spathe which resembles the primary spathes except for being smaller and more attenuate in the lower part, branches densely pilose-velutin-

ous in every part, with the peduncular part included in the respective spathe; flower-bearing branchlets alternate-distichous. Lower branches much larger than the upper ones, sometimes twice branched, bearing 10-12 and more flower-bearing branchlets. Flowering branchlets filiform, each arising from the axil of a thin, membranous, narrowly lanceolate-acuminate bract. Flowers in small glomerules, usually 2-4 together, alternate-spirally arranged, each with a minute bracteole. Calyx shortly tubular, $\frac{1}{2}$ inch in diameter, slightly longer than broad, obsoletely trigonous; segments acute. Corolla tubular for more than the lower half, divided into 3 broad deltoid teeth, 4-sulcate on the inner side. Stamens with their filaments united with the corolla-tube and forming a fleshy ring (at the mouth of the tube) which is provided with 6 small linear teeth; anthers dorsifixed, erect, small, shortly ovate, rotundate at both extremities; pollen exceedingly small, globose. Carpels forming a turbinate body, fleshy below, cartilaginous in the upper part, suddenly contracted into the style; stigma small, very shortly 3-lobed.

Fruit ovoid, sometimes globose-ovoid; mesocarp very small, with a few anastomosing-reticulate fibres; endocarp thinly parchment-like-woody, fragile. Seed free in the endocarp, $\frac{2}{3}$ - $\frac{3}{5}$ inches long, $\frac{13}{4}$ - $\frac{17}{24}$ inch broad, rotundate at both extremities; hilum at the base of one side; raphe occupying one side of the seed with 7-8 ramifications; albumen distinctly ruminant; embryo conical, basilar, slightly eccentric.

HABITAT.—Brazil (Bahia, Pernambuco, Piahy). Sometimes grown in Indian Gardens.

USES.—The berries, though bitter, are, either raw or boiled, eaten by the Indians; also the spadix is edible.

The leaves serve for a variety of purposes, such as thatch, pack-saddles, hats, etc., and in time of scarcity the young leaves are chopped up and given as fodder to horses and cattle.

The well-known vegetable wax is produced by the leaves of this palm. The young leaves, after they have been detached from the tree, are shaken, when each leaf yields about 50 grains of a whitish scaly powder, which is melted in pots over a fire; the wax then collects at the surface of the water. The Brazilians use the wax

occasionally to adulterate bees' wax ; it is, however, mostly imported into Europe for manufacturing candles and for various other purposes.¹

From the juice of the palm arrack and syrup are prepared. The roots are used medicinally as a substitute for sarsaparilla.

From the inner part of the trunk the natives prepare for home consumption a kind of farina.

The wood, especially of the lower part of the adult tree, is very durable, and lasts for many years, even when exposed to the weather ; for this reason the trunk is used for almost every purpose, especially for all the framework of houses and the enclosures for cattle. The wood is not less useful in the manufacture of musical instruments.

CULTIVATION IN EUROPE.—This species is a stove palm. It is best cultivated in a compost of two parts of loam, one of peat, and one of sand. Perfect drainage and liberal supply of water are required.

II.—BORASSINÆ.

Spadix simple or little branched with thick cylindrical twigs ; flowers markedly diclinous, dimorphic, invested with bracts, the male in 1-8 cincinni in grooves of the twigs ; carpels 3, fully united, producing a 1-seeded drupe ; leaves fan-shaped, induplicate. The only tribe is :

3. BORASSEÆ.

DISTRIBUTION.—Tropical Africa from Guinea to Egypt and Natal, Mascarine Islands, Seychelles Islands, Coast of Arabia, East Indies, Philippines, New Guinea, Borneo, Sumatra.

The tribe comprises the following genera: *Pholidocarpus*, *Medemia*, *Hyphæne*, *Latania*, *Borassus*, *Lodoicea*.

KEY TO THE GENERA DESCRIBED BELOW.

Stamens 6.—Fruit by the abortion of 2 carpels					
unilocular with one central woody, ovate					
stone	...	...	...	...	... <i>Hyphæne</i> .

¹ Gissern, P. Die Amerikanische Carnaubapalme und die Gewinnung des Carnaubawachses. Seifens Ztg. Augsburg, 28 (1901) 581, 597-598.

Zimmermann, A. Die Wachspalme (*Copernicia cerifera*). P. flanze. Tanga. 3 (1907), 191-195.

- Stamens 8.—Fruit with 3 bony stones, or rarely
by abortion with 1 or 2 *Iatania*.
Stamens 6.—Fruit mostly with 3 stones; seed
sinuate *Borassus*.
Stamens 8.—Fruit generally with one bilobed,
kidney-shaped stone; seed bilobed *Lodoicea*.

HYPHÆNE, Gaertn. Fruct. I (1788) 28, t. 10, f. II (1791)
13, t. 82.

(From the Greek ‘Hyphaino,’ to weave, alluding to the fibres of the fruit.)

Benth. & Hook. Gen. Pl. III, 940.—Dalla Torre et Harms Gen. siph. p. 38.—*Douma* (Poir.) in Nouv. Duhamel ed. 2, IV (1801-9).—*Cucifera* Del. Fl. d’Egypte (1813), 145.—*Doma* Lam. Illustr. t. 900.—*Camæriphes* Dill. Cat. pl. Schawii No. 143 (1738).—O. Kuntze Rev. Gen. II (1891) 728 (non *Pontedera*). Baillon Hist. des Fl. XIII, 324.

Unarmed except for the spines on the petioles. Stem cylindrical or ventricose, simple or dichotomously branched. Leaves in a terminal crown, orbicular or flabellate: segments ensiform, petiole concavo-convex, plano-convex or more rarely bi-convex; sheath short, open; ligule oblique or equilateral. Spathes cylindrical, incomplete; spadices diœcious, male and female similar; spadix branches alternate; flower-bearing branches subfastigate; bracts semicircular. very densely imbricate; bracteoles membranous, bearded. Male flowers: Sepals linear-oblong, imbricate, connate at the base. Petals broadly ovate, obtuse, concave, imbricate, connate at the base into a short stalk. Stamens 6; filaments short, subulate; anthers linear, inserted at the bifid base. Rudiment of ovary O. Female flowers larger than the male, very shortly pedicellate. Sepals 3, ovate-orbicular, obtuse, imbricate. Petals a little smaller than the sepals, broadly ovate, obtuse, imbricate. Staminodes 3, connate into a membranous ring. Ovary subglobose, obscurely 3-lobed, 3-celled; stigmas 3, minute, sessile, terminal, at length excentric; ovule attached by a broad base to the side of the cell.



MALE INDIAN DOUM PALM (*Hyphæne indica*, Becc.) IN THE BASSEIN BOTANICAL GARDEN.

Fruit sessile or stalked, terete or obscurely lobed, often flat or intruded at the base and apex, 1-celled; stigma basal; pericarp fibrous, with a shining epidermis; endocarp woody, fleshy inside. Seed adnate to the endocarp, erect, ovoid or obovoid, intruded at the base; testa very hard, fuscous; raphe reticulately branched; albumen homogeneous, hollow; embryo apical.

Species at least 40.¹

DISTRIBUTION.—All over tropical and subtropical Africa, Arabia, Western India.

INDIGENOUS SPECIES.

HYPHÆNE INDICA, Becc. in *Aricoltura Coloniale*, II (1908) fasc. III.—*Borassus dichotoma*, White in *Graham Cat. of Plants of Bomb.* (1839), 226. *Mart. Hist. Nat. Palm.* III, 318, n. 179.

NAMES.—Indian Doum Palm; Oka mundel (in Gujarat).

DESCRIPTION.—Stem dichotomously branched, similar in general aspect to that of *H. thebaica*. Leaves flabellate-multifid, sub-orbicular, measuring $3\frac{2}{3}$ feet from the apex of the petiole to the end of the central segments. Central segments rather much smaller and shorter than the intermediate ones, not inserted at the apex of the petiole, but at various heights on the stout rhachis which reaches almost half-way up the limb. Petiole about $3\frac{1}{3}$ feet long and about $\frac{1}{5}$ inch broad at the apex, regularly rounded on the under side, channelled on the upper side of the lower part and almost flattened near the apex, where it is plano-convex in a transverse section, armed with stout, uncinatè, black spines with broad base. Ligule very irregular and asymmetrical, being much more developed on one side of the limb than on the other,

¹ On *Hyphæne* see:—

Beccari, O. *Palmarum Madagascariensium Synopsis*. *Engl. Bot. Jahrb.* Vol. 38 (1906), Beibl. No. 87, p. 1-41.

Beccari, O. *Le Palme 'Dum' od Hyphæne e più specialmente quelle dell' Africa Italiana*. In '*Agricoltura Coloniale*,' Anno. II, fasc. III. Firenze 1908, p. 137-183.

Carstensen, G. *Doum Palms in India*, *Journ. Bombay Nat. Hist. Soc.* VI, 271.

Dammer, U. *Ueber Hyphæne*. *Engl. Bot. Jahrb.*, 30 (1901), 267.

Thiselton-Dyer. *Flora of Tropical Africa*, Vol. VIII.

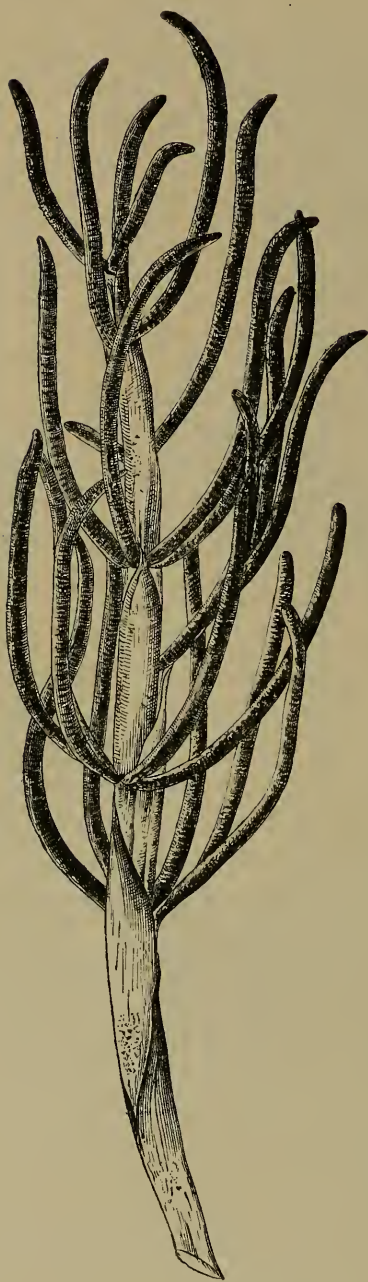


FIG. 24.—Male Spadix of *Hyppocrene indica*.

margin subligneous, irregular and spinulose. Segments about 40; those of the middle portion of the sides are the largest and separate from each other about $\frac{2}{3}$ -1 foot from the ligule; segments gradually narrowing into a very acuminate point which is divided for the distance of $3\frac{1}{2}$ -4 inches into 2 secondary, rigid, very acuminate points; primary ribs of under surface rather stout and marked with small impressions; ribs of upper surface slightly weaker and finely punctulate-impressed under the magnifying glass.

Male spadix (Fig. 24) rather stout about $3\frac{1}{4}$ feet long (in Beccari's specimen) and about $1\frac{2}{3}$ inches in diameter at the peduncular part. Spathes tubular, ending at the apex on one side in a triangular, acuminate limb, covered all over with a dense woolly tomentum which is difficult to remove; branches of spadix about 6, the lowest 1 inch in diameter, bearing about 6 flowering branchlets digitately arranged, the next bearing 5, and the apical branch which is biconvex and only $\frac{1}{3}$ inch in diameter bearing only 2; the branches arise from their respective spathes. Branchlets $\frac{2}{3}$ - $\frac{5}{6}$ feet long, $\frac{3}{8}$ - $\frac{2}{5}$ inch in diameter, the axillary part tough and subligneous, no flowers at the base for the distance of about $\frac{2}{3}$ inch. Flowers 3



FEMALE INDIAN DOUM PALM (*Hyphane indica*, Becc.) GROWING AT BARODA.

for each scale and rising from it successively, having the appearance of small straw-coloured globules. Segments of corolla rigid and parchment-like, rotundate, and very strongly striate-nervose; at the apex the flowering branchlets are suddenly narrowed into a small obtuse tail about $\frac{1}{3}$ inch long and devoid of flowers.

Female spadix not known.

Fruits pretty regularly obovate-pyriform, markedly and gradually attenuate towards the base, subhemispheric or almost regularly rotundate in the upper third, laterally slightly compressed, devoid of a distinct keel, with numerous and small inequalities on the surface; base somewhat irregular with small gibbosities and only $1\text{--}1\frac{1}{5}$ inches broad, whilst in the upper third the antero-posterior diameter of the entire fruit is $2\frac{2}{5}\text{--}2\frac{3}{5}$ inches and the transverse diameter 2 inches; total length of fruit $3\frac{3}{5}$ inches; pericarp very large in comparison with the seed; sarcocarp well developed, $\frac{2}{5}$ inch thick on the sides and $\frac{1}{2}\frac{1}{4}\text{--}\frac{1}{2}$ inch at the base and apex; endocarp $\frac{1}{4}\text{--}\frac{7}{24}$ inch thick on the ventral side, thinner on the other side and slightly thicker below and above, regularly incurved at the apex above the seed, leaving a broad opening in its tissue for the plumule to pass through at the time of germination. Seed slightly above the centre of the fruit, obovate, $1\frac{2}{5}$ inches long and 1 inch broad towards the upper third, from where it gets very little narrower towards the flattened base: the upper part is broadly conical and the apex very obtuse; albumen $\frac{7}{24}\text{--}\frac{1}{3}$ inch thick, the cavity being conform to the shape of the seed. Embryo perfectly apical.

Pedicle $\frac{1}{2}$ inch long, comparatively slender, $\frac{7}{24}$ inch broad at the base and then restricted to a kind of neck; perianth-lobes opaque, puberulous, non-striate.

HABITAT.—Gujarat: Diu (Burkill), “passim in Guzerat,” frequens in insula Diu (Vaupel), Ahmedabad, lat. bor. 23° (Car. de Hügel), probably all along the Western Coast of India down to Goa (Gammie).

NOTE.—There are specimens of a species of *Hyphæne* growing at Jaffna in Ceylon; but whether they are identical with the Indian Doum Palm or not, has not been decided as yet.

ILLUSTRATIONS.—Plate XXXIII shows a male tree of *Hyphæne indica* growing in Bassein Bot. Garden on the island of Salsette.

Mr. G. A. Gammie, to whose kindness we owe the photographs reproduced on this and the next plate, informs us, that there is only one specimen of the Indian Doum Palm growing at Bassein and that this tree supplied part of the material on which Dr. Beccari founded his *Hyphaene indica*.

Plate XXXIV shows a female tree growing at Baroda.

* * INTRODUCED SPECIES.

HYPHENE THEBAICA, Mart. Hist. Nat. Palm. III, 226 (ed.1), 225 (ed. 2) excl. syn. nonnullis, tab. 131, 132, 133 (excl.—*ic. spadiceis masculæ* in tab. 132); Becc. in Agricolt. Colon. (1908) II, fasc. III.—*Corypha thebaica*; Linn. Sp. Pl. ed. 2, (1763) 1657.—*Cucifera thebaica*, Delile, Descr. de l'Egypte II, 57, t. 1, 2; Dict. d' Hist. Nat. XIII (1819), 472.—*Douma thebaica*, Poir. Encycl. Suppl. II, 519.—*Hyphaene cucifera*, Pers. Ench. II, 2245.—*Chamæriphes thebaica*, O. Kuntze, Rev. Gen. Pl. II (1891) 728.

NAMES.—Egyptian Doum Palm, Gingerbread Tree; Mama (in Egypt).

DESCRIPTION.—Stem terete, 10-30 feet high, about 1 foot in diameter, simple or more frequently dichotomously branched. Leaves 20-30 in a terminal crown on each branch; petiole sheathing at the base, triangular below, plano-convex upwards, spiny on the margins, with rusty tomentum; lamina suborbicular; lobes 20 or more, linear-lanceolate, acuminate, $1\frac{1}{2}$ feet long, 1 inch wide; primary nerves thick, concave above, secondary numerous.

Male spadix about 4 feet long, 1-2 inches thick at the base, at first erect, afterwards patent; spathes nearly cylindrical; flower-bearing branches 6-7 inches long, 3-2 at the end of branches 3-4 inches long; bracteoles $\frac{1}{2}$ line long. Flowers in pairs, shortly pedicellate. Calyx divided down to the base into 3 narrow, acute, yellow sepals, contracted below. Corolla stipitate with the segments imbricate, rotundate and cucullate at the apex, thin and not strongly striate-nervose. Stamens 6, rarely 7; filaments subulate from a thickened base; anthers linear, slightly sagittate, nearly basifixed. Rudiment of ovary consisting of 1-3 small and short unequal points.

Female spadix like the male; bracteoles densely imbricate, with a transverse line of tomentum half-way up the back. Flowers very shortly pedicellate, calyx-lobes orbicular-ovate, light green. Petals smaller than the sepals, orbicular-ovate, concave. Stamínodes 6. Ovary globose or 3-lobed; stigmas sessile or nearly so.

Fruit more or less obliquely ovoid or oblong, irregular, usually a little more constricted in the upper part than in the middle and lower part, always much longer than broad, $2\frac{2}{3}$ - $3\frac{1}{2}$ inches long and $2\frac{1}{5}$ - $2\frac{1}{3}$ inches broad, more or less obtusely triangular in transverse section, with the abortive carpels often much developed; surface rather irregular and usually very distinctly punctate-impressed. Sarcocarp rather strongly impregnated with sugar; wall of endocarp $\frac{1}{12}$ - $\frac{1}{8}$ inch thick on one side, on the other (which corresponds to an obtuse longitudinal keel), $\frac{1}{6}$ - $\frac{1}{5}$ inch, not thicker below than on the sides and not incurved at the apex of the seed; fulcrum of seed much depressed and little developed. Seed more or less ovate-conical and flattened at the base, always much attenuate above and, therefore, more or less pyriform, almost circular in transverse section, $1\frac{2}{3}$ - $1\frac{3}{5}$ inches long, $1\frac{1}{12}$ - $1\frac{1}{8}$ inches broad.

The fruit varies a good deal by being more or less attenuate above. A longitudinal section of the fruit of *H. thebaica* and *H. indica* is given on page 930 of Vol. XVIII of this journal illustrating a short note on 'The Indian Doum' by I. H. Burkill.

HABITAT.—Along the valley of the Nile in Middle and Upper Egypt; Shaikh Othman near Aden.

HISTORY OF THE DOUM PALM.—Eighteen centuries already before Christ we find the Doum Palm in the middle course of the Nile. Anna, an officer of Thutmes I. (18th dynasty), superintendent of the granaries of Amon and director of the royal works, enumerates with great complacency on the inscription of his tomb¹ the trees

¹ Brugsch. H. Recueil de monuments égyptiens. Leipzig, 1862: part I, p. 48, pl. XXXVI.

Moldenke. C. E. Ueber die in alta gyptischen Texten erwähnten Bäume und deren Verwerthung. Leipzig, 1886. p. 18.

Boussac, H. Le tombeau d'Anna (Mém. de la mission archéol. au Caire, 1896, t. xviii. fasc. I, pl. s. n.).

which he had planted in his garden. Amongst them there were not less than 120 Doum Palms. If the fruits discovered by Flinders Petrie at Kahun were not introduced from Æthiopia, we must even admit that the tree was planted in Egypt 800 years before that period.¹

The palm received its native name 'Mama' ² (which means "divided in two") from the fact that the stem of the tree is usually bifurcate. Theophrast, too, (371-286 B.C.) who calls the palm cucifera (κουκιόφορος) makes this the distinctive character of the tree :

"The tree," he says,³ "which is called cucifera, shows with regard to its trunk and leaves a great resemblance to the Date Palm, but it is distinguished by the fact that, whilst the stem of the Date Palm is simple and entire, its trunk is divided into two branches, each of which in its turn is split up into two secondary branches, which bear short and few branches."

The Doum Palm is usually shown with the bifurcate stem on the pictures of the Egyptian tombs. There is one of them which represents the general arrangement as well as all the details of the parc of an officer of Amenhotpu II., the seventh king of the 18th dynasty. Sycamores, Date-Trees and Doum Palms play an important part in the artistically laid out garden.⁴ On a picture from one of the tombs of Tell-el-Amarna⁵, on the contrary, the artist represented the Doum Palm with a simple stem, but with the characteristic fan-shaped leaves.

The fruits of the Doum Palm which have been found in immense quantities in the pharaonic tombs and specimens of which may be seen in every Egyptian museum of Europe, are remarkable for their shape and size.

¹ Joret, C. Les Plantes dans l'Antiquité et au Moyen Age. Paris. 1897. I. 108.

² Moldenke, C. E. I. c. p. 66.

³ Theophrastus. Historia plantarum. lib. iv, cap. II.

⁴ Wilkinson, G. The manners and customs of the ancient Egyptians. London 1878, vol. I, p. 377, pl. 150.

Woenig, F. Die Pflanzen im alten Aegypten. Leipzig. 1886, p. 232.

Moldenke, C. I. c. p. 41.

Maspero, G. Histoire ancienne des peuples de l'Orient. Paris. ed. 4. 1886. vol. I. p. 291.

⁵ Lepsius. Denkmäler, vol. III, pl. 95.



EGYPTIAN DOUM PALM (*Hyphaene thebaica*, Mart.).

“They differ from the dates,” says Theophrast¹, “by their dimension, their shape and their taste: large enough to fill one’s hand they are round and not oblong; being of yellow colour they contain a sweet and agreeable juice. They are not arranged in bunches like the dates, but grow isolated. The kernel is large and very hard.”

The fruits were called ‘ququ’ in ancient² Egypt and it is not difficult to recognise in this word the root of Theophrast’s *κουκι* (of the word *κουκιδόφρος*).

USES.—The leaves of younger plants are eaten by camels. The old leaves are put to many minor uses.

The trunk is used for making water conduits, “and it is possible,” says Burkill, “that it might contain a little sago in just the same measure as the common Indian fan palm, enough to make it a famine food.”

The thick fleshy-fibrous part of the fruit resembles gingerbread both in colour and taste, hence the palm is often known as the Gingerbread Tree.

The chief use of the palm is for the manufacture of buttons from the hard inner fruit-wall. It is also turned into beads for rosaries.

CULTIVATION IN EUROPE.—The Doum Palm is difficult to cultivate. It grows best in rich sandy loam. Fresh seeds vegetate readily, but the young plants are of slow and precarious growth.

CULTIVATION IN INDIA.—Old specimens of the Egyptian Doum Palms may be seen in many a garden of India and Ceylon, and, as a rule, they are much better developed than the tree growing in Egypt. The climate seems, indeed, to exercise a great influence upon the development of this palm. When Haeckel saw the Doum Palm in Ceylon he was surprised to find it there under an aspect so altered that he could scarcely recognize them.

“Adaptation,” he says, “to perfectly different conditions of existence have made the Doum Palm of Egypt quite another tree in Ceylon. The trunk is developed to at least double the thick-

¹ Theophrastus l. c. lib. IV, cap. 2, 7.

² Loret, V. Recherches sur quelques plantes. I. Les Palmiers d’Egypte. (Recueil de travaux relatifs à la Philologie et à l’Archéologie égyptiennes et assyriennes. t. II, p. 24.

Joret, C. Des noms de palmier (Revue des études grecques. Paris (1892), p. 417.

ness, much larger than in its native land; the forked branches are more numerous but shorter and more closely grown; the enormous fan-leaves are much larger, more abundant and more solid; and even the flowers and fruit, so far as my memory served me, seemed to be finer and more abundant. At any rate, the whole habit of the tree had so greatly changed in the hothouse climate of Ceylon that the inherited physiognomy of the tree had lost many of its most characteristic features. And all this was the result of a change of external conditions and consequent adaptation, more particularly of the greater supply of moisture which had been brought to bear, from its earliest youth, on a plant accustomed to the dry desert climate of North Africa. These splendid trees had been raised from Egyptian seed, and in twenty years had grown to a height of thirty feet." (A Visit to Ceylon, p. 180.)

ILLUSTRATION.—Not having at our disposal a good photograph of an Egyptian Doum Palm growing in India, we reproduce on Plate XXXV a photograph of some characteristic specimens which grow at Shaikh Hammed, near the ruins of Athribis and Dair-el-Abiadh in Egypt.

LATANIA, COMM., Juss. Gen. 39.

(After the vernacular name "Latanier" of *Latania burbonica*, Lam., now *Livistona chinensis*, R. Br.).

Gaertn. Fruct. II, 185, t. 120.—Jacq. Fragm. t. 8.—Mart. Hist. Nat. Palm. III, 222, t. 148.—Illustr. Hort, t. 229.—Baker Fl. Maurit, 380.—Benth. & Hook. Gen. Pl. III. II, 940, 118.

Of moderate height; leaves long-petioled, palmate-flabelliform; blade deeply laciniated.

DIOECIOUS.—Flowers in distichously-branched axillary spadices, each branch sheathed by an obliquely truncate spathe. Male: Spikes cylindrical, with pits formed by the union of imbricating bracts, each pit containing a single flower; perianth-lobes imbricate; stamens 15-30, exserted; filaments connate at the base; pistillode a triquetrous column or of 3 or more subulate processes. Female: Bracts toothed on their outer edge, combined in pairs to form a cup for each flower; flowers fewer than in the male spikes; staminodes forming a toothed cup; ovary 3-celled; stigmas 3, distinct.



COMMERSON'S LATANIA (*Latania Commersonii*, Gmel.).

Fruit a drupe, containing 3 or, by abortion, 1-2 pyrenes; mesocarp succulent; pyrenes convex and sculptured externally; seed with a testa which adheres completely to the endocarp; albumen homogeneous; embryo apical.

Species 3.

DISTRIBUTION.—Mascarene Islands; generally introduced in Indian gardens.

CULTIVATION IN EUROPE.—The species of *Latania* are very handsome stove plants. They grow well in a compost of two parts of rich loam and one of peat, to which may be added a small quantity of sand. Perfect drainage is required. Propagation is effected by seeds. These are sown in a compost similar to that just mentioned, and placed in a moist, gentle heat.

LATANIA COMMERSONII, Gmel. Syst. II. 1035: Bory de St. Vinc. Voy. dans les îles de l'Afrique; Mart. Hist. Nat. Palm. III. 223, t. 148, fig. 4. t. 154, 161, fig. 2, t. W; Baker Fl. Maurit. and Seych. 381.—*L. playacoma*,——Comm. Mss. et Palmarium Vol. t. 26, 27, 28: Aub. Pet Thouars Mélanges de Bot., Observat. sur les Plant. des îles d'Afr., 51.—*L. rubra* Jacq. Frag. bot. 13, n. 49, t. 8; Willd. Spec. Plant. iv. 2. p. 878, n. 1: Spreng. Syst. Veg. ii. 623, n. 1.—*Cleophora lontaroides*, Gaertn. Fruct. —II. 185. t. 120, fig. 1.

NAMES.—Commerçon's *Latania*: *Latanier*; *Latanier rouge*; *Latanier de l'île de Bourbon*.

DESCRIPTION.—Palm 40 feet high. Petiole 4-6 feet long, slightly tomentose, the margins smooth, spiny in young plants; blades 5-5½ feet long, dark green above, paler beneath; segments lanceolate, acuminate, 2 feet long, 3¼-3½ inches broad, their margins entire, spiny in young plants; veins and margins tinged with red. Male spadix 3-6 feet long, with 9-16 branches; spikes 7-10 inches long, ¼-½ inch broad, arising in clusters of 4-20 from the end of the branch within the mouth of the spathe. Perianth ⅙ inch long; margin of segments fringed; stamens 28-32; pistillode pyramidal-trigonus. Female spadix 3-6 feet long, with 8 or more branches, each bearing 3 spikes; free portion of bracts deltoid. Fruit a drupe, globose, 1½-1¾ inch in diameter; pyrenes obovoid, 1¼-1½ inch long, marked with numerous ridges which pass from



Fig. 25.—A young specimen of *Latania Commersonii*, Gmel.

the base to the apex and then curve down again, a central ridge always most prominent : seed with a light brown testa.

HABITAT.—Mauritius, in various parts of the island, but not abundant : Seychelles (not indigenous) ; Bourbon.

Cultivated in most European conservatories and in many Indian gardens.

USES.—The fruit is eaten by the Negroes, but it has a rather disagreeable flavour. The leaves are used as thatch.

ILLUSTRATION.—Plate XXXVI shows a well developed specimen of this species growing in the Royal Bot. Gardens of Peradeniya. The photograph was taken by Mr. Macmillan.

LATANIA LODDIGESII, Mart. Hist. Nat. Palm. III. 224, t. 161, fig. II, 10-14 ; Baker Fl. Maurit. and Seych. 381.—*L. glaucophylla*, Hort.—



LODDIGES' LATANIA (*Latania Loddigesii*, Mart).

Cleophora dendriiformis, Loddiges in Cat. plant. hort. proprii in Hackney prope Lond.

NAME.—Loddiges' *Latania*.

DESCRIPTION.—Trunk 50 feet high. Petiole 3-4½ feet long, tomentose, the margins entire in the mature, spiny in the young plant; blade 3-5 feet long, very glaucous; the primary veins beneath slightly tomentose, and tinged with red, especially in young plants; segments 2 feet long, not quite 3 inches broad, unequally acuminate, the edges spiny in young plants.

Male spadix 5½ feet long, with 8-12 branches; spikes 1-08 inches long, $\frac{3}{8}$ — $\frac{7}{12}$ inch broad, arising in clusters of 3-9 from the end of the branches on a level with the mouth of the spathe. Perianth $\frac{3}{8}$ inch long; segments not fringed; stamens 16-20, or more; pistillode of 3-5 grooved filaments nearly as long as the stamens. Female spadix 3½-4 feet long, with 5-6 branches, each bearing 1 or 2 spikes.

Fruit a drupe, obovoid or pyriform, trigonous, 2½ inches long, 1¾ inch broad; pyrenes elongate-obovoid, faintly mucronate at the apex, 1¾-2¼ inches long, $\frac{3}{4}$ - $\frac{5}{8}$ inch broad, with a central ridge along the convex face with tree-like branching in the upper third, the inner surface furnished with a central crest, usually for only a part of its length. Seed with a dark brown testa.

HABITAT.—Mauritius, on Round Island, Flat Island, and Coin de Mire; introduced on the main land.

ILLUSTRATION.—We reproduce on plate XXXVII a photograph of *Latania Loddigesii*, taken by Mr. Macmillan in the Roy. Bot. Gardens of Peradeniya. The stem is covered almost from the base, with the bases of fallen leaves.

LATANIA VERSCHAFFELTII, lemaire, Ill. Hort. VI, t. 229.¹—*L. aurea*, Duncan, Cat. Hort. Maur. 52.

DESCRIPTION.—Trunk 40 feet high; petiole 5-8 feet long, densely tomentose, with entire, orange margins, spiny in young plants; blade pale green, 4½-5 feet long; segments 2½ feet long,

¹ Cf. U. Dammer: *Latania Verschaffeltii*, Lem. Gard. Chron. ser. 3, 1902, vol. 31, p. 97-98.



Fig. 26.—Young male specimen of *Latania Loddigesii*. Mart.
From between the leaves rises the male spadix.

above 2 inches broad, acuminate, the entire margins and veins beneath slightly tomentose.

Male spadix 4-8 feet long, with 5-10 branches exceeding the spathes in length; spikes $1\frac{1}{4}$ -2 feet long, $\frac{3}{8}$ inch broad, arising singly or in clusters of 2-3 on each branch; perianth $\frac{1}{12}$ - $\frac{1}{4}$ inch long; stamens 20-30; pistillode a triquetrous column, shorter than the stamens. Female spadix 3-5 feet long, with 1-4 branches

bearing usually solitary spikes; staminodes forming a minute cup with 6-8 teeth.

Fruit a drupe, obovoid, slightly trigonous, 2 inches long, $1\frac{1}{2}$ inch broad; pyrenes oblong, $1\frac{1}{3}$ - $1\frac{3}{4}$ inch long, $\frac{5}{8}$ inch broad, the convex surface marked by many hard prominences and a median ridge continued from the base to form a prominent apical crest and thence passing a short way down the inner face and ending abruptly; on each side also a deep groove separates the apical crest from a sharp process, whence one or more ridges run downwards. Seed with a light brown testa.

HABITAT.—Rodriguez; abundant over the island.

CULTIVATION IN INDIA.—This palm is of slow growth in this climate, but bears full exposure well.

USES.—Of the beautifully marked wood walking sticks are made.

BORASSUS, Linn. Gen. Nat. 1220.

[From the Greek 'Borassus,' the cover surrounding the palm-fruit; 'Bora,' food for animals; according to Brande 'Borassus' means the skin of the date, whilst Hamilton states that it means the spathe common to most palms.]

Gaertn. Fruct. I. 21, t. 8.—Roxb. Corom. Pl. I.—71-72.—Kunth Enum. Pl. III, 221.—Mart. Hist. Nat. Palm. III, 219, t. 108, 121, 162.—Griff. Notul. III, 167.—Kurz For. Fl. II, 531.—Drude Bot. Zeitg., 1877, 635, t. 5.—Luers. Botan. II, 338.—Hook. Fl. Brit. India, VI, 481.

A very tall dioecious palm; trunk stout, unarmed. Leaves terminal, fan-shaped, plicately multifid, sides of lobes induplicate in veneration; petiole spinous; ligule short. Spadix very large, interfoliar, simply branched; peduncle sheathed with open spathes, male with stout cylindric branches, that are densely clothed with closely imbricating bracts, enclosing spikelets of flowers which hence appear as if sunk in cavities of the branch; female spadix sparingly branched, bearing few scattered solitary flowers. Male flowers biseriate in small scorpioid spikelets enclosed in the bracts, secund; perianth glumaceous; sepals and petals 3 each, imbricate; stamens 6, pistillode of 3 bristles. Female flowers larger, globose;

perianth fleshy, greatly accrescent in fruit; sepals imbricate; petals convolute; staminodes 6-9; ovary globose, entire or 3-4-cleft, 3-4-celled; stigmas 3; ovules basilar, erect. Fruit a large subglobose drupe with 1-3 obcordate compressed pyrenes; pericarp thinly fleshy; stigmas terminal. Seeds compressed, quadrate, top 3-lobed; testa adherent to the pyrene; albumen equable, hollow; embryo apical.

Species 1.

BORASSUS FLABELLIFER, L. Sp. Pl. 1187; Hook. Fl. Br. Ind. VI, 482; Trim. Fl. Ceyl. IV, 336.—*B. Flabelliformis*, L. Syst. Veg. ed. 13, 829.—Thw. Enum. 329; Roxb. Cor. Pl. I, 50, t. 71, 72; Fl. Ind. III, 790; Griff. Notul. III, 167; Mart. Hist. Nat. Palm. III, 221, t. 108, 121, 162; Kunth. Enum. III, 222.—Brand. For. Fl. 544.—Kurz. For. Fl. II. 529.—*Borassus tunicata*, Lour. Fl. Cochinch. ed. Willd., p. 760.—*B. aethiopum* Mart., l. c. 221.—*Lontarus domestica*, Rumph. Herb. Amb. I, t. 10; Ham. in Mem. Wern. Soc. V, 314; Gaertn. Fruct. I, 21, t. 8.—Rheede Hort. Malab. I, t. 9, 10.

NAMES.—Palmyra Palm, Brab Tree¹ (English); Tala, Tal, Trinaraaja (Sansk.); Tal, Tar, Tarka jhar (Hind.); Tad, Tamar (Mar.); Tal, Talgachh (Beng.); Tan (Burm.); Taark Dizaar (Deccan); Tala-wruxium (Tanjore); Tal, Tal gaha (Singh.); Panay, Panaymaram [the tree], Arn Panay [the male tree], Purn-Panay [the female tree], Vadaly [the young tree], Oly [the leaf], Panang-kai [the fruit], Nonku [the kernel] (Tamil); Pootpady, Poottaly, Ponthy, Talam (Poetical Tamil); Tatechutta [the tree], Potutadu [the male tree], Pentetadu [the female tree], Bonda [the young tree], Tatikaya [the fruit], Tataku [the leaf], Nungu [the edible part of the fruit] (Tel.); Lontar (Malay); Rontal, Sualan (Java); Coli (Timor); Murume (Cochin China); Panuguera, Palmeira macha brava (Portug.); Jager-Boom, Weingeevende Palm-Boom (Dutch); Palmyra Palme (German); Rondier (French).

DESCRIPTION.—Trunk attains 100 feet in height and 2-3 feet in diameter, black, swollen above the middle and again contracted upwards, while young covered with dry leaves or the bases of petioles, old stems marked with the black narrow scars of the

¹ The name 'Brab,' commonly used in Bombay, is derived from the Portuguese 'brava', 'wild palm.'

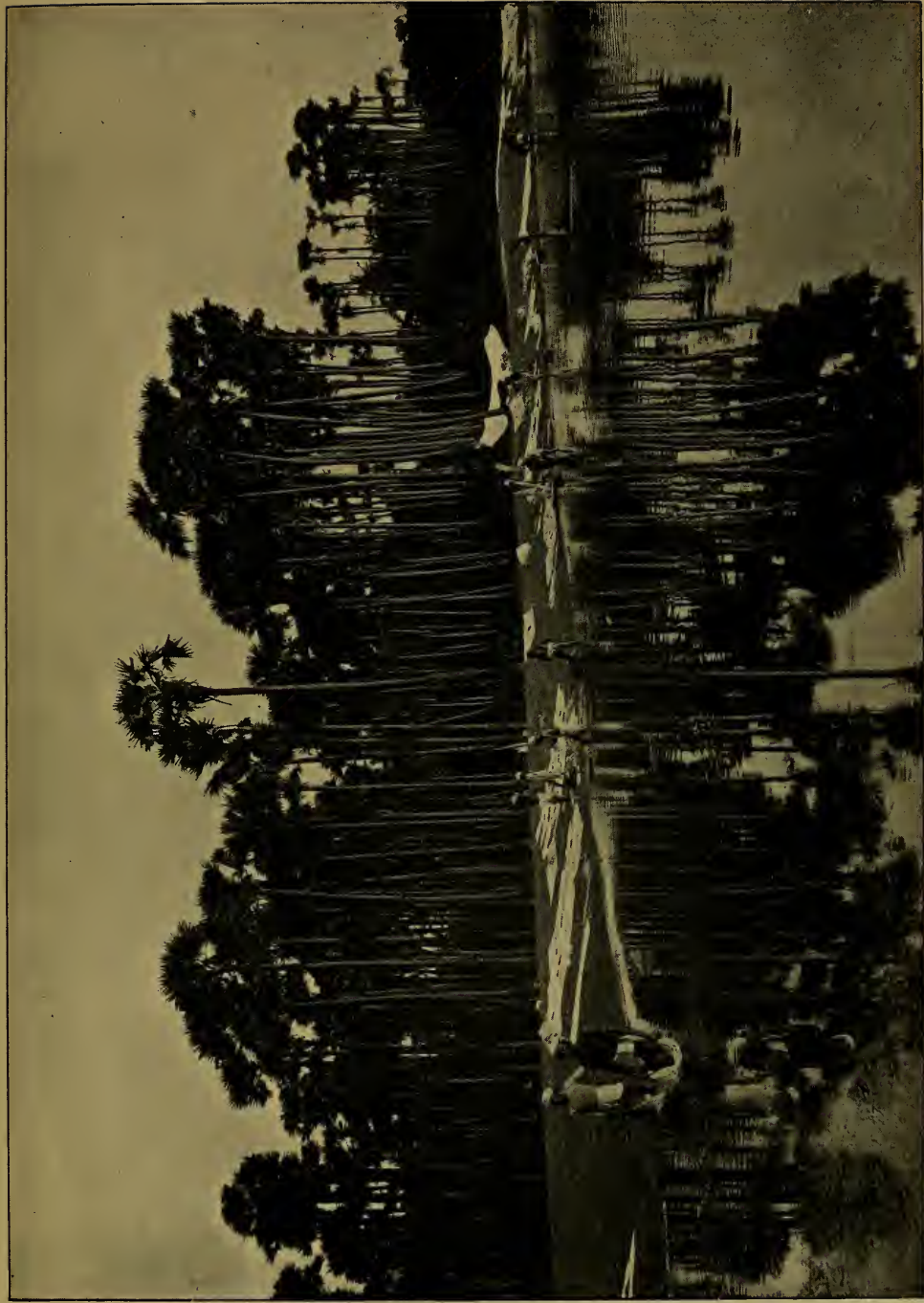
petioles, near the ground with a dense masse of long rootlets. Leaves 3-5 feet in diameter, palmately fan-shaped, rigidly coriaceous, many-cleft into lanceolate or linear 2-fid lobes; segments 60-80, shining, folded along the midrib, with spinulose margins; petiole 2-4 feet long, stout, semiterete, edges with hard horny spinescent serratures; ligule short.



FIG. 27. Young Palmyra Palm (taken on the sea shore at Mahim, Bombay Island).

Male spadix simply branched, sheathed with many imbricated spathes, each vaginated at the base, but soon splitting into a long, concave, pointed, boat-like sheath, in substance very strong and fibrous; when young they are covered with a soft, downy, rust-coloured substance; (sometimes in the lower axil of the sheaths there is a bundle of smaller sheaths, forming a spathe like that now described, but without spadix). The superior 4 or 7 sheaths embrace each ramification of the spadix, each ramification ending in 1-3 cylindric spikes, beautifully imbricated with innumerable bracts. The lower and shorter ramifications of the spadix universally composed of 3 spikes spreading from each other in the same plane and distant from each other at the points about 3-5 inches, the middle one extending from 2-3 inches beyond the other two. One or two of the higher ramifications sometimes divided into only 2 spikes and occasionally consisting of one only. These spikes are 12-15 inches long, while the lower ones measure only 9-12 inches. The bracts of the spikes are broad, wedge-shaped, retuse, adhering by their lateral margins to the keel or back of the next above, forming a cavity for a second spikelet of about 10-12 small, sessile flowers; seldom more than one expanded at a time, beginning with the uppermost, so that there is a long succession of them. Flowers of spikelets arranged in 2 vertical opposite rows, beautifully serrated into each other, each spikelet forming an arch with its convex side undermost, the common receptacle of the little florets forming the other. Flowers appearing in parallel nearly straight rows, running from bottom to top, or in parallel oblique rows running from right to left, or from left to right round the spike, according to the position from which they are viewed. Sepals narrowly cuneate, tip truncate, inflexed. Petals shorter, obovate spathulate. Stamens 6; filaments connate with the corolla into a stalk; anthers large, subsessile, oblong.

Female spadix simple; spikes terminating the branches of the spadix; the lower end of the spadix is a smooth stem, sheathed with several spathes; spikes enveloped in bracts which cover all parts of it and rise over the flowers to the number of 8-12; a barren bract encircles the spadix, just below where the flowers commence to rise from it, and the upper end of the spadix, extending to a



A GROVE OF PALMYRA PALMS (*Borassus flabellifer*, Linn.) IN NORTHERN CEYLON.

length of 2 or 3 inches beyond the flowers, is also enveloped by these bracts. Flowers larger than the male flowers, 1 inch in diameter, globose. Sepals fleshy, reniform, imbricate; petals smaller, convolute; staminodes 6-9. Ovary subtrigonus, (3-4-celled) celled; stigmas sessile, recurved.

Fruit a drupe, when young pretty distinctly trigonous, but when old, the pulp round the pyrenes so swells as to give the fruit the appearance of an almost perfect globe, 6-8 inches in diameter, seated on the greatly enlarged perianth. Pyrenes 3-1, obcordate, fibrous outside; endosperm horny, hollow; mesocarp fleshy and fibrous.

GERMINATION.—When the nuts begin to germinate, the space within the kernel fills up with a cream coloured substance of the consistency of cheese¹. From this the root of the germ or young plant protrudes, through that end of the nut which was attached to the spadix, the body or actual stem of the plant following, until the two first leaflets are thrown up with the shell of the nut attached. All these parts are, when very young, beautifully incased in an entire leathery substance like the sheaths of the spadix. These seedlings are called 'dantalas' or 'kelingoes'.

Each of these little trees has 1-4 rootlets attached to it. The lower part of the stem, where those roots are attached, resembles much that end of a carrot, parsnip or radish to which the crop is attached; and indeed the plant altogether looks very like an inverted long parsnip.

These dantalas, which are found beneath the surface, are about 1 inch thick at the lower part and taper off to a mere point, being 12-15 inches long. A slit or groove runs from near the bottom

¹ For the chemical aspect of the process of germination, see: Gatin, C. L., Contribution à l'étude chimique de la germination du *Borassus flabelliformis* L., in Bull. Soc. Bot. de France (1905), 4th series, vol. v., pp. 558-561.

By the same author: Nouvelle contribution à l'étude chimique de la germination du *Borassus flabelliformis*, L. in Rev. Gén. Bot. Paris, 18 (1906), 481-483.

Besides: Recherches anatomiques et chimiques sur la germination des palmiers. Paris, 1906, pp. 307-308.

Transformation diastasique du mannose en glucose au cours de la germination du *Borassus flabelliformis*, L., in Bull. Soc. Bot. de France, vol. 55 (1908), pp. 383-386.

to the top. This groove is nothing else but the folding inwards of the first leaf, which composes nearly the entire thickness of the stem. If it be cut across, it will be found to enclose the inner leaves in a small oval pipe about $\frac{1}{8}$ inch in thickness.

When these dantalas are about 9 to 12 months old, they have usually two leaves just issuing from the surface. These are from $1-1\frac{1}{2}$ inches in breadth, and from $2\frac{1}{2}$ -3 feet in length, having only four or five folds in each leaf. When the leaves issue from the ground, no part of the stem is seen, but a succession of leaves goes on, increasing in breadth and thickness, for 6 to 7 years. The stem close to the ground is then perhaps as stout as ever it will be; indeed in many cases stouter, as these trees harden and compress by age. (Ferguson.)

GROWTH OF PALMYRAS.—On this subject we refer to:

Jackson, A. B.—The rate of growth of Palmyras, Indian Forester, Vol. 35, p. 394.

Lushington, A. W.—The growth of Palmyras. Ibid., Vol. 35, p. 573, Vol. 36, p. 362.

Hole, R. S.—The growth of Palmyras. Ibid., Vol. 35, p. 632.

HABITAT.—A native of tropical Africa. Cultivated in the Indian Archipelago, the Trans-Gangetic Peninsula, Ceylon, South and Central India, Bengal and Lower Sind. In North-West India as far north as Aligarh and Shahjehanpur. Isolated trees in gardens in Rohilkhand and the Upper Ganges, Doab, as far as Saharanpur. Also on both sides of the Persian Gulf, attaining there about the same latitude as in North-West India, *i.e.*, 30° N. L. Immense groves of it are found on the Malabar coast, extending from Cape Comorin through Travancore, Calicut, Goa, and the Bombay Presidency, on through Gujarat and up some distance on the banks of the Indus. But what are emphatically called the Palmyra regions may be included in a line extending along the Coromandel coast from Cape Comorin to Madras including the northern portion of Ceylon and from Madras all along, taking in a considerable belt of the coast between that and Point Palmyras. and then passing up to Gya on the 85^{th} degree of E. L. and nearly 25° of N. L. After that the line should be carried on about due east until it reaches Ava, below which on the banks of the



PALMYRA PALM (*Borassus flabellifer*, Linn.) IN FRUIT.

Irrawaddy, there are immense groves of this Palm. From Ava the line should pass down south-east, through the Malayan Peninsula and the Indian Archipelago, including Sumatra, Borneo, Celebes, Flores, and the Molucca Isles.

The Palmyra Palm is found in various parts of the mountain district of Ceylon, including the vicinity of Kandy and of Badulla at elevations of 1,680 and 2,450 feet respectively, having a mean annual temperature of about 74° at the former and $71\frac{1}{2}^{\circ}$ at the latter.

Although immense groves are found on the banks of the Irrawaddy, from the sea coast up to nearly as far as Ava or Amara-pura in Burma, and as far inland as Gya in Bengal, and in isolated patches all round and through Ceylon, still the most congenial places for their favourable development will be found in low sandy plains scarcely elevated above the level of the sea, and where they are exposed to the burning sun, and the force of at least one of the monsoons. Such are Jaffna, with the surrounding islands, and other portions of the northern province of Ceylon, the district of Tinnevely, with portions of the Madura Collectorate, portions of the Madras and Bombay Presidencies and of the Indian Archipelago.¹

FLOWERS.—In March and April; fruit ripens in April and May and is matured in July and August.

THE PALMYRA PALM AND ITS GUESTS.—The tree is well adapted for sheltering animals and hence they are resorted to by birds at night, and by rats, squirrels, mungooses, monkeys, etc., during the day time. When the leaves of a tree are undisturbed, the number of bats sometimes occupying it is incredibly great.

A great number of epiphytical plants find support and nourishment in the axils of the leaves. A very interesting union is that formed by the Palmyra and several species of Ficus. The birds which feed upon the fruit of Fig trees “drop the seeds in the *alæ* (axils) of the leaves, where they grow and extend their roots, etc., so as in time to embrace the parent Palmyra, except its upper

¹ Ferguson, W., Description of the Palmyra Palm of Ceylon. Colombo 1888, p. 11.

parts. In very old ones the top thereof is just seen issuing from the trunk of the Banyan, as if it grew from thence, whereas it runs down through its centre, and has its roots in the ground, the palm being the older. For such the Hindoos entertain a religious veneration saying it is a holy marriage instituted by Providence." (Roxburgh.)

USES.—Every part of the Palmyra Palm is turned to account in some way or other.¹ By far the most important aspect of this tree is as a source of food.

1. *The juice or toddy*.—This is almost as famous for its use as notorious for its abuse. The juice can only be obtained after the young flowering branches have made their first appearance. The trees do not generally bear until 12 to 15 years after they have been planted, and only then can the male be distinguished from the female trees. Ferguson, who examined trees of both sexes most minutely before the spadices were to be seen, could detect no peculiarity in shape, size or colour by which to distinguish them. Were it possible to do so, it would be of the utmost importance to extensive cultivators of this useful palm. When the trees have arrived at the age mentioned, the spathes begin, in the months of November and December, to protrude from amongst the leaves near the top of the trees, which have then attained heights varying from 8-25 feet. The next natural course would be the bursting of these spathes, and the production of fruits, but in many cases the laws of nature are herein completely thwarted, for the toddy drawers now step forward and attack the trees of both sexes, but oftener the males, for the extraction of toddy,—the life juice of the inflorescence. In the various written descriptions of the ways in which this is done, the information is often contradictory and unsatisfactory. Some writers, and recent ones too, state that the fruits of the trees are pierced for the purpose. Others say, that a hole is bored in the body of the tree in which a plug is inserted, to be removed when toddy is wanted. In this conflict of opinions we consider it much safer to follow an experienced guide.

¹ Grisard, J., Produits et utilisation du Rondier, in Rev. Cult. Colon. Paris, 9 (1901), 110-114.

Ferguson gives an excellent description of the whole process from personal observations made in Ceylon.

When the proper season arrives, which is in November and December, the too frequently degraded and drunken toddy-drawers are seen and heard busy at work in the Palmyra groves throughout the Peninsula of Jaffna. Their practised eyes soon fix on those trees that are fit for the 'scalping knife', and if they have not dropped the footstalks of the leaves, the first operation, if the trees are valuable, is to wrench these off. This done the toddy-drawer, armed with his leathern protector for his breast, his raceme-batten of wood, his small thongs, straight and crooked knives, with the 'side leather pouch' to contain them, procures a piece of tough jungle vine, or a strip of the footstalk of a fresh leaf of a young Palmyra or Cocconut tree, which he thoroughly twists, and then converts it into a sort of loop of such dimensions as to admit of his feet getting through to a span large enough to allow them clasp the tree. This done he puts his feet in this thong, stands close to the tree, stretches himself at full length, clasps it with his hands, and pulls his feet up as close to his arms as possible; again he slides up his hands, and the same process is repeated, until, by a species of screw process, he ascends to the summit of the tree. When the trees are high, some use hoops of the same material, large enough to encircle both the tree and the toddy-drawer who slides it up the tree, so that it is always a support to the body while the climber is in the act of taking a fresh grasp.

Arrived at the summit, amongst the leaves, the climbing apparatus is laid across a leafstalk, and the pruning and phlebotomy commence. One or two of the lower leaves are left as a support to the toddy-drawer until the operation is completed. He then draws his crooked knife, which, on a small scale, a good deal resembles a reaping hook, and rids the tree of all the accumulated dirt, such as old leaves, the net work which supports them, and, if an old tree that bore fruit before, the stumps of the fruitstalks. Then all the leaves are cut off, excepting 3 or 4, and the young top bud of the tree. Besides the removal of all these, the crooked knife is now used in shearing off the outer covering of that part of the tree

from which spring the leaves and the racemes. These latter are supported during this operation, by being tied up by several thongs to the footstalks of the uncut leaves. The pruning having been completed, all or most of the spathes are effectually encompassed from end to end by thongs, to prevent the membrane which covers the inflorescence from bursting. The racemes thus tied are then beaten and crushed between the wooden battens to wound them, and to hurry on the flow of toddy. This done and the spathes being secured to stalks of the remaining leaves, the toddy-drawer descends. The operation of beating and crushing takes place for 3 successive mornings, and on each of the 4 following a thin slice is cut from the points of the racemes, to encourage the flow of sap and keep them from bursting. On the eighth morning a clear sweet liquor begins to flow from the wounded spadix, which is indicated by the 'Toddy Birds' and crows fighting and chattering amongst the trees. The toddy-drawer then ascends with a chatty or toddy-receiver stuck to his belt behind. He places the ends of the spadix in these, and when secured leaves them till evening, when they are found to contain quantities of this liquor. The operation of attracting the juice is repeated every morning and evening, or in the mornings only, until the whole of the spadix is sliced away.

The trees are drained in this way for several months of the year, but if the operation is repeated on the same tree for 3 successive years, without allowing any of the buds to burst naturally, the trees are said to die. A spadix continues to give toddy for about 5 months, at the rate of 3 or 4 quarts a day, and while seldom three spadices are yielding toddy on the Cocoanut tree, seven or eight will yield juice at once on the Palmyra Palm. An expert climber can draw the toddy from about 40 trees in a few hours.

In Jaffna a distinction is made between 'toddy' and 'sweet toddy'. The former, called by the Tamils Cullo, is the juice when it is allowed to ferment, which it does in a few hours after sunrise. Sweet toddy, called Carupaner, is obtained by sprinkling the inside of the toddy-receiver with lime or chunam, which keeps it from fermenting.

The toddy procured from the male Palmyra tree is said to be sweeter than that from the female. The latter, besides, yields only about half as much sap as the male.

Many trees are encircled near the ground with a strip of tar, etc., to prevent ants and other vermin getting up and making a decoction of the toddy in the chatties.

It is not a little amusing to notice the various comparisons to which this juice has given rise. Sir W. Jones compares it, fresh from the tree, to Poubon water, fresh from the fountain, or to the best mild champagne; Malcolm, the American, naturally enough associates its taste with that of his native cider; while Johnson, a traveller in Abyssinia, ranks it no higher than ginger beer. It is possible it bears a resemblance to all these, and indeed a good deal of the Ceylon ginger beer is made from toddy. The result of partaking of toddy in the early morning is generally a listless drowsy sensation.

2. *Sugar or Jaggery*¹.—It appears, says Ferguson, that in the time of Menu, upwards of 4,000 years ago, the Hindus knew how to make sugar from the flowers of the Madhuca tree (*Bassia latifolia*); and this being the case, there is great reason to suppose that sugar was made from some of the palm-trees at a much earlier period. Sugar candy is alluded to by Megasthenes under the name of ‘Indian stone,’ and to this day the crystals formed either from jaggery or the juice of the cane are called ‘Catcandu,’ or stone sugar. The common Indian name for the finer sorts of sugar, ‘Cheenee’ has been supposed to point to the Chinese origin of the production.

The usual process of making jaggery, as pursued at Jaffna, is exceedingly simple. The sweet toddy is boiled until it becomes a thick syrup; a small quantity of scraped cocoanut kernel is thrown in that it may be ascertained by the feel if the syrup has reached the proper consistency and then it is poured into small baskets of Palmyra leaf where it cools and hardens into jaggery. In these small plaited Palmyra baskets it is kept for home consumption,

¹ These terms are variously derived from the Sanskrit ‘Sakar,’ Arabic Shakar whence the Latin ‘Saccharum,’ and the English ‘Sugar.’

sent coastwise, chiefly to Colombo, or exported beyond seas to be refined. About 3 quarts of toddy suffice for boiling into 1 lb. of jaggery. The juice of the Palmyra is richer in saccharine matter than that of most other palms, in consequence, perhaps, of the tree more generally growing in dry sandy soil and in a dry climate.

To make 'Vellum' or crystallized jaggery, which is extensively used as a medicine, the process is nearly the same as for the common substance; only the syrup is not boiled for so long a period. The pot which contains it is covered and put aside for some months, at the end of which period the crystals are found in abundance.

Jaggery, besides being exported in large quantities, forms a considerable portion of the food of the poorer classes in India and Ceylon. The sweetness of Burmese bread seems to depend on the use of toddy-juice to raise it.

Amongst a variety of purposes to which it is put, is that of being mixed, together with whites of eggs, with lime from burnt coral or shells. The result is a tenacious mortar, capable of receiving so beautiful a polish that it can with difficulty be distinguished from the finest white marble.

It is stated that palm sugar, which is chiefly the produce of the Palmyra tree is more granulated and higher priced than that obtained from the cane. Small round cakes of jaggery were used formerly and to some extent still pass as currency in the Tinnevely district.

3. *Vinegar*.—Large quantities of vinegar are made in Ceylon from toddy. It is prepared in the following way:—A glazed earthen jar is buried three-fourths its depth in the earth, in a spot exposed to the full influence of the sun. A quantity of Palmyra or Cocoanut tree toddy is daily thrown into the jar, until it is nearly full, when the mouth of it is carefully clayed up. The fermenting process immediately commences and continues for some months. At a certain stage of the process, which is ascertained by removing the cover and testing the quality of the vinegar, quantity of burnt paddy is thrown in, which in the course of a few days change the watery colour of the fluid to that of pale brandy. The vinegar is then fit to be bottled. It is used

extensively for pickling gherkins, limes, the cabbage from the heart of the Cocconut and Palmyra trees, and several other substances.¹

The following particulars regarding the preparation of vinegar apply to the Madras Presidency²: The producers are the toddy-shopkeepers, and they convert their unspent toddy into vinegar in either of the following ways. The toddy is placed in a clothed earthen pot and kept there till fermentation is complete and the liquid has become sour. The pot is either kept above ground for a month or two, or is buried underground for three or 4 months or more, and then taken out. The longer the pot is kept closed and underground, the better the quality of the vinegar. In either case pure vinegar is obtained when the pot is opened and the sediment has been removed. Vinegar is also made by heating fermented toddy either by fire or by exposure to the sun. It is procured in a shorter time by this method, but the quantity is less than by the slow or natural fermentation. The vinegar thus obtained is, however, used both for medicinal purposes and in cooking. There is no shop or bazar in Madras where country-made vinegar is specially sold, and the trade is not so extensive as that in either English or German vinegar.

4. *Palm Wine or Arak*.—If the toddy be distilled the result is palm wine (arak). “The extent to which the spirituous liquor is employed,” says Watt, “may be judged from the fact that at one time the Bombay Government became so alarmed at the excessive consumption of arak in Surat that they ordered large numbers of this useful palm to be destroyed. In this connection it is interesting to observe that Fryer, who visited Surat in 1673, mentions that on drawing near the roadstead they saw groves of Brab-trees, from which the Parsis made a ‘wine akin to toddy.’ This wine the sailors drank, and the result was perpetual disturbances of the peace. The plentifulness of the toddy resulted in the district being overrun by ‘soldiers and seamen of the Moors.’ ”

5. *The Fruit*.—Within the shell of the young fruit there is a jelly-like fluid which is eventually transformed and deposited

¹ Ferguson W. l. c. p. 29.

² Watt, G. The commercial products of India. London, 1908, p. 1111

as a hard albumen. When the fruit is half-ripe (April-May), while the shell is yet soft, they are often torn off or cut from the tree, and stripped of the outer bark. The shell of it is then perforated with the finger, and then the soft kernel can be sucked up. It is pleasant to the taste and exceedingly refreshing; but too large a quantity of it ought not to be taken, for, according to Rumphius, it debilitates the stomach. The jelly and soft albuminous layers are sometimes cut into pieces and flavoured with sugar and rosewater.

The fruits, when ripe, vary in colour from a light gold at the end which is attached to the spadix, to brown and nearly black at the other. Some trees have all their fruits of a beautiful gold and others of a very dark colour, and these differences in their colour and other properties have induced the natives to give them various names. The fruits, when they fall ripe from the tree, are sometimes eaten raw, but are more generally roasted, and the scene exhibited at a roasting feast of Palmyra fruits, is in Ferguson's estimation one of the most purely Oriental that can be witnessed. "When at hand, the shade of an Illipe (*Bassia longifolia*), of a Margosa (*Melia Azadirachta*), or Tamarind (*Tamarindus indica*) is chosen; a fire is lighted on the ground, composed of Palmyra leaves, etc., and the party, men, women, boys and girls, squat around, sucking the pulp out of the fibres of each fruit as it is roasted, tearing them asunder with nails and teeth in the most approved and natural style, all appearing wrapped in the highest possible state of alimentive enjoyment."

The mesocarp of the ripe fruit is a soft, mellow, luscious, semi-saccharine and farinaceous matter, known as Palmyra pulp. The period during which the fruits are obtained being short and a greater number ripening than the inhabitants can consume, preserved pulp (called punatoo in Ceylon) is made in the following manner:— "Pandals (stages) are constructed within 4 or 5 feet of the ground, and on these Palmyra-leaf mats are spread; the ripe fruits are then taken, torn up, put into ola-baskets containing fresh water, and are there squeezed by the hands till the pulp with the water forms a jelly. Layers of this jelly are spread on the mats to dry; this process is repeated for 15 to 18 days, one layer being deposited

above the other until they amount to about 15 or attain to about half an inch in thickness. The mats are exposed in the sun to dry, being covered at night and protected from the rains and dews." The tough leathery kind of preserved pulp made from the remaining fruits gathered at the end of the season, is much inferior to the other, and is called Tot Punatoo. The pulp is preserved in ola-baskets or bags by being hung up in the smoke. It is generally eaten plain or mixed with gruel made from the pounded farina of the young Palmyra seedlings and with cocoanut kernel.

Rumphius' ¹ graphic account of the way in which Punatoo is prepared, is well worth being quoted in this place: "In making 'Punata' more labour is required, for after the ripe fruits, which fall from the tree from July to September, have been collected, the stalks and the cups are twisted off with the hands; the outer rind is stripped off, and the peeled fruit are washed in water, and cleansed from the adhering fibres and earth; they are then pressed out, and rubbed for a long time with other limpid water, until all the yellow juice has been drawn out; this is sometimes repeated twice or thrice, lest the juice should be lost; and it assumes a thick consistency; and with a hooked stick they cleanse it from all the fibres of the shell; and then they prepare a machine made of sticks, which is here called Parra Parra, by the Malays Lante Lante, and in Malabar Pandel. On this machine they spread large palm mats from 14 to 16 cubits long, on which they then pour out the liquor so thick, that scarcely a leaf of the mat can be seen; they then leave it to dry for one day and on the next day they pour fresh juice, which is again left to dry, after repeating the same labour until this cake has acquired the thickness of three fingers; which labour is generally continued for 15 or 16 days; but these mats are folded up during night, and are covered with leaves to preserve it from cats and dogs, who are exceedingly fond of this cake. When this becomes as hard as cheese, it is cut into square pieces or cakes, and they raise them gently from the mats with a knife and place them in layers in baskets, and sprinkle the layers with water in which salt has been dissolved.

¹ Rumphius, G. E., *Herbarium amboinense*. Amstelod. 1741-1755, Vol. I, Cap. IX.

“ And these baskets or sacks are placed on a three-legged stool, which they fasten by a rope to a beam, that for some days they may be impregnated with smoke; but this should not be done too much, lest the Punata should become bitter; they also place the ropes in such a manner, that mice cannot enter; and then this work is finished, and the Punata or Pœnata so often mentioned is prepared—and this they reserve for use during winter.

“ The people of Maccassar prepare the fruit in a much more convenient manner, nor do they spend so much labour. When the juice has been only expressed, they pour it into large pans and mix it with the farina of rice, and thence prepare many kinds of food.”

The seed within the albumen is also eaten, being sold in Bengal under the name ‘ talsans.’

6. *Young seedlings (dantalas, kelingoos) as vegetable.*—After the Punatoo, described above, is taken from the ripe fruits, the nuts are kept for future use. At a convenient season they are sown in 6 to 8 layers, under loose, sandy soil, thrown up in parts of the gardens or fields close to the dwellings of the natives. Planted in beds in this manner, there is, no doubt, a greater heat created in consequence of the fibre surrounding the nuts, &c., which induces them to grow more rapidly than otherwise and better for purposes of food. According to the ‘ Agricultural Ledger ’ about 50 fruits are planted to the square yard, and these may produce 100 and more dantalas.

These are taken up when they are two or three months old, the nuts cut from the points of the leaves, and then the seedlings are exported or eaten in various ways. “ To keep these kelingoos for future use, they are deprived of the beautiful parchment-like sheath in which they are completely enveloped, and then dried in the sun. Those dried in this manner, before they are boiled, are emphatically called Odials, and those boiled after, are called Poolooc Odials. It is the Odials that are reduced to flour or meal of which the favourite Cool (of the Singhalese), or gruel is made. The kelingoos roasted, boiled, or cut into slips and fried like slices of Bread Fruit, are eaten by the natives and will be found in the bazaars of Colombo and elsewhere all the year round. In their dried state they seem to be chiefly farina with a few fibres running through them, and their taste is very astringent. It is of the

Odials that the flour once so prized by the Dutch, according to Bennet, is made; though in these days [1850] we never hear of this substance being sent to the Cape of Good Hope or Holland. A substance called Putoo is made of the Kelingoo flour. To the meal is added a little water, into this are put prawns or small fish, scrapings of Cocoanut kernel, unripe jack fruit, etc. This mixture is put into an ola-basket which is placed on the top of a pot of boiling water, covered over with a chatty, and cooked by the steam. This is reckoned a great delicacy." (Ferguson).

In India the vegetable is eaten chiefly by Kolis and low-class people.

In a cheap year the gross value of a crop per acre at ordinary market rates would be about Rs. 1,800, rising in a dearer season to Rs. 3,000.

7. *Medicine*.—The juice of this plant is used as a stimulant and anti-phlegmatic. "Europeans, especially delicate females, in India, who are apt to suffer much from constipation, find a cup-full of this toddy, drank every morning at five o'clock, one of the simplest and best remedies they can employ. The Vytians prescribe it in consumptive cases." (Ainslie, *Materia Medica*.)

The root is considered cooling and restorative, as also the gelatinous contents of the unripe seeds. The ash of the spathe is given for enlarged spleen.

A useful stimulant application, called toddy-poultice, is prepared by adding fresh drawn toddy to rice-flour till it has the consistence of a soft poultice; and this being subjected to a gentle fire, fermentation takes place. This, spread on a cloth and applied to the parts, acts as a valuable application to gangrenous ulcerations, carbuncles, and indolent ulcers. The light-brown cotton-like substance from the outside of the base of the leaves is employed as a styptic for arresting hæmorrhage from superficial wounds. (*Pharmacop. of India*).

8. *Wood*.—The trees have to arrive at a considerable age before they are of use for timber; when a hundred years old, they are excellent. The heart of the tree is soft, but the outer wood is hard, heavy, and durable, consisting of numerous thick black vascular bundles. The weight of the solid foot is 65 lb., the value

of P. 944. Pillars and posts for the verandahs of the houses, well-sweeps, etc., are made of this timber. Trunks split into halves, with the heart scooped out, are used as spouts for various purposes, but more especially for carrying away the water from the eaves of houses. The thick parts of the trunks are generally taken for rafters, the thinner or tops for laths. The trunks of young trees or the tops of old ones are often cut into pieces and placed where game is plentiful, as in the Patchelepalla district of Jaffna. The wild hogs and hares are very fond of the soft, white, spongy hearts of the logs, and in resorting to them to eat, are frequently shot by the natives. The dark outside wood of very old trees is used to some extent in Europe for umbrella-handles, walking canes, paper rulers, fancy boxes, wager-stamps, and other articles. It is well known in India that the female tree produces the best and hardest timber, and that that of the male is considered so inferior that, unless the trees are very old, it is never used. The juice is used in the preparation of cements.

9. *Leaves and Fibres*.—When the leaves are intended for thatch of houses, and for making fences for gardens and fields, they are laid flat on the ground in layers over each other and often with weights upon them to assist in flattening them. The thatch formed of these does not last so long nor is it so handsome as that made from the plaited cocoanut leaves. Palmyra thatch, when laid on well, lasts for two years, but being so plentiful and cheap, the leaves are generally renewed yearly.

In India as well as in Ceylon the leaves are extensively used for manuring the rice fields. The fan parts are put into the ground till they rot off; this is found to be an excellent manure, giving a quantity of silicious and other matter to the soil.

Mats of various sizes, used instead of carpets on floors, for ceiling and for many other purposes, are made of the Palmyra leaves. Ola bags are also formed and are useful for purposes where strength of texture is not an object. Even water baskets for raising water are made of the leaves. They are circular on the top but taper down in a triangular form to the bottom which is a point. They are occasionally woven into hats and caps. At Diamond

Harbour near Culcutta, hats have for many years been made of this material and sold to the European sailors who visit Calcutta.

Umbrellas made of these leaves, though doubtless very good for protection from sun and rain, are rather inconvenient, as they are made in such a way that they cannot be folded. They have a handle and are about the size of an ordinary umbrella when expanded. Single leaves are occasionally used as a protection from the sun when the weather is very hot.

A great variety of fans are made of the leaves; some are nicely painted and covered with pieces of transparent and colourless talc, others are made to fold into a small compass, and again to expand, when wanted, into an almost perfect circle.

Several kinds of fibre may be obtained from the Palmyra Palm. A loose fibre which surrounds the base of the leaf-stalk; a fibre which may be separated from the leaf-stalks; a fibre called tar, which may be prepared from the interior of the stem; a fibre or coir derived from the pericarp, and the fibrous material of the leaves.

The leaf-fibre is utilised in the manufacture of the basket-ware of Madras, produced at Pulikat in Chingleput, Kimedi in Ganjam and Bezvada in Godavari, etc. Fine strips of the leaves specially prepared and dyed are plaited into braids and worked up into fancy boxes, cigar-cases and the like.

Some years back investigations were instituted in India with a view to determining the extent to which the cord-like fibres might be employed in brush-making, as substitutes for the American piassaba fibre (*Attalea funifera*) and the Ceylon kittul (*Caryota urens*). So far indications have not been obtained of a very great demand for these special Indian fibres.

The stem or tar fibre is prepared in some special way by the fishermen so that it becomes pliable and can be plaited into fish-traps. It is neither spun nor twisted, a single thread or fibro-vascular bundle being used. The method of preparation adopted by the fishermen has not as yet been made public. The export trade in tal coir, or 'palm-fibre,' as it is often called, centres largely in Tuticorin.

One of the most singular purposes to which the Palmyra leaf is employed in Ceylon is that of being used as a plug to keep open

and enlarge the holes bored in the lobes of men's ears and in which are ultimately inserted those huge golden rings and masses of jewellery, which the wealthy among the Tamils are so fond of displaying. For this purpose a thin leaflet is neatly cut into a narrow stripe and closely rolled up. In this state its tendency to expand assists materially in keeping the hole open.¹

The following passage, taken from Rumphius who wrote in 1741, is more of historical interest: "By the inhabitants of Macassar," he says, "these leaves are so much esteemed, that none of the common people dare carry an umbrella or large broad-brimmed hat made of them, except the three highest noblemen in that country, namely, the Princes of Tello, of Goa, and of Sadrabona. They accordingly make umbrellas from the leaf of the Talla (Palmyra), all the radii of which are interwoven with tinsel, and surrounded with a border of ebony, or even covered with Rottanga and silk, so that this broad-brimmed hat or umbrella is always open. If they wish to carry it, they place it on a stick, the handle of which is covered with gold, and which it is not proper for their servants to carry without distinction behind the back; this is permitted only to the nobles." (*Herbarium amboinense*.)

10. *Leaves as writing material*.—The most singular purposes to which they are devoted is that of writing upon. A well-informed Tamil Native furnished Ferguson with the following information: "The oldest Hindoo author who mentions writing on Olas (Palmyra leaves) is Panniny-rishee who lived about the year 790 of the Caliyugam; that is 4161 years² ago, according to Hindoo reckoning. He resided near the source of the River Ganges at a place called Arrittuwarum. He was the inventor of the Sanscrit Alphabet, although verses in Sanscrit were in existence before his time, committed to memory and thus transmitted." We are not able to say what degree of evidence may be attributed to these statements. It is probable that Hærnle's 'Epigraphical Note on Palmleaf, Paper and Birchbark'³ contains some more critical

¹ Cf. Ferguson, W. l. c. p. 23-25. Watt, G. l. c. p. 170.

² Ferguson wrote this in 1850.

³ In Journ. As. Soc. Beng. Vol. 69, pt. I, No. 2.

information on the subject, but, unfortunately, this publication was not at our disposal.

Pliny¹ says expressly that the most ancient way of writing was upon the leaf of the Palm tree, an assertion with all the weight of evidence in its favour.

The following quotations give some interesting details:—Marshall, in his account of the Coccoanut Tree, writes:—

“The leaflets are sometimes used to write upon, and the instrument employed to make the impression is an iron stylus, the pen of the scriptures. The stylus was used by the Romans to write on waxen tablets, leather, etc. The leaves of the Palmyra (*Borassus flabelliformis*), or Talipot (*Corypha umbraculifera*), are, however, much more frequently employed for this purpose. Contracts and other legal instruments are often engraven upon tablets of copper, similar in shape to a slip of the talipot leaf, which have occasionally a border of silver or gold. . . . Palm-leaves, when they are prepared to receive the impression of the stylus, are called ollahs. The natives write letters to one another upon ollahs, which are neatly rolled up, and sometimes sealed with a little gum-lac; in this manner they pass through the post-office. During the operation of writing, the leaf is supported by the left hand, and the letters scratched upon the surface with the stylus. Instead of moving the hand with which they write towards the right, they move the leaf in a contrary direction, by means of the thumb of the left hand. To render the characters more legible, the engraved lines are frequently filled by besmearing the leaf with fresh cow-dung, which is tinged black, by rubbing the lines over with cocoanut oil, or a mixture of oil and charcoal-powder. The natives can write standing, as well as walking, and they rarely use tables.

“Palm leaves, and perhaps the leaves of trees that do not belong to this natural class, were much used by the ancients as writing materials, hence the word leaf (of a book) is synonymous with that of a tree.”

The statements respecting the age of Palmyra manuscript books

¹ Lib. XIII, Cap. 2.

and the number of years they are likely to last, are somewhat conflicting. Ferguson does not doubt that Palmyra-leaf manuscripts 400 or 500 years old exist in Ceylon. He says that they are certainly of a more durable quality than paper, and resemble parchment in their texture, when well prepared.

We read in an article written by Brande¹ in 1849 on 'The language and literature of the Island of Bali': "The time at which the manuscript was composed, which I made use of, is the year of Saka 1724 (corresponding to the year of Christ 1802). To judge from the outward appearance I should have taken it to be much older; in 46 years the lontar-leaves (Palmyra) have already become much injured and it seems to prove what is said also of Indian manuscripts, that they can't survive 100 years. This probably is also one of the causes that in Java, in so short a time, almost the whole of the ancient literature was lost, and that when the desire for the old literature was revived, hardly any of the old manuscripts could be discovered. In Bali also we must not look for old manuscripts; however those which are guarded and transcribed in the families of the priests, may almost be considered as original, since in these families the knowledge of language and religion is preserved with the minutest care."²

The Palmyra books are never much beyond two feet in length and two inches in breadth, as the size of the webs between the little ribs will not admit of their increase in size.³

CULTIVATION IN INDIA.—"This grand palm is not much used in gardens, and perhaps rightly so. It takes up much space, and generally looks unhappy compared with the same species on hill sides near Bombay, where its tall cylindrical stem crowned with immense fan-shaped leaves is a grand feature in the landscape. But in the Botanical Gardens at Calcutta a special use has been found for which it is well adapted. On the outskirts of the garden a gently winding path, about 12 feet in width, has this palm planted near the sides about 10 feet apart; the effect of the

¹ Journal of the Indian Archipelago and Eastern Asia, Vol. III, No. 4, April 1849.

² Cf. also some notes of Lombok in the 'Journal of the Indian Archipelago', etc., Vol. II, No. 3, p. 161.

³ Ferguson, l. c. p. 26.

thick stems ornamented by the persistent leaf-stalks is strangely happy. To grow this palm quickly a moist climate is necessary, and the seed should be sown where it is required to grow, because it first sends a shoot downwards to a depth of 3-4 feet, and then from the bottom of this shoot the bud, which forms the stem, is developed." (Woodrow). Some few trees that from unknown causes do not flower in spring, put on their flowers in the cold season, and give a scanty supply of toddy, but in spring many are rendered artificially barren by breaking off the flowering bud as it begins to form. These also flower in the winter season, and are called Basanti. They do not give above $2\frac{1}{2}$ maunds of juice, but this is of as much value as the 6 maunds which a tree gives in spring. Either the male or female will answer for the spring or winter crop, but the female alone will yield juice in the rainy season. When this is wanted, the fruit is allowed to form, and afterwards the point of the spadix or stem which supports the clusters is cut and allowed to bleed. This does not prevent a great many fruit on each cluster from coming to maturity. Palms managed thus are called Ghour. The fruit ripens in August, but many of the stems continue to bleed until October.

CULTIVATION IN EUROPE.—This species is a stove plant. It grows well in good fibrous loam, leaf mould, and sand, mainly in the former. It is propagated by seeds only which must be sown in strong bottom heat.

Fungal disease of the Palmyra Palm.—In 1906 the Imperial Mycologist, E. J. Butler, described a severe epidemic of disease in palmyra and other palms in the Godavari District of the East Coast of India.¹ As a result of field and microscopic examination, the cause of the disease was stated to be a fungus belonging to the genus *Pythium*. Butler gave a description of it, under the name of *Pythium palmyrorum*, in the Memoirs of the Department of Agriculture in India in February 1907.² A fuller account of the disease was published by the same author in September 1910,

¹ E. J. Butler. Some diseases of Palms. Agricultural Journal of India, Vol. I, p. 299, Oct. 1906.

² E. J. Butler. An account of the Genus *Pythium* and some Chytridiaceæ. Memoirs of the Dep. Agricult. in India. Vol. I, No. 5 (1907), p. 82.

under the title: 'The Bud-Rot of Palms in India.'¹ It is from this paper that we borrow the following notes:—

The disease was practically confined to a comparatively limited area in the delta of the Godavari River. A few cases of the same disease were observed at Changarachery (Travancore) in 1907, where the fungus was found producing its characteristic spores in young leaf blades of cocoanut trees in the unexpanded stage of the bud.²

The bud-rot is said to have first appeared in Addenkivarilanka, an island in the Gautami Godavari belonging to the Ramachendrapur Taluk, about 1890. From this it spread to both banks of the river and extended along the banks as well as inland. Judging from the extension that has occurred in the area as a whole, the rate of spread is estimated little over a mile a year. It has, however, been ascertained, that in certain places an extension of between 2 and 3 miles occurred. It must not be supposed that the disease is uniformly distributed within its area. Great difference may be observed in the severity of the attack from village to village and even from field to field. It seems that the nature of the soil exercises a direct influence on the susceptibility of the palm to attack. Thus, whilst trees along water-courses and in periodically flooded localities die more quickly and in larger proportion, little disease has been found in the light sandy soils of the sea coast villages. The black soils appear most to favour the disease.

The way in which infection is spread from tree to tree is not yet fully understood. Butler has shown that direct application of the parasitic fungus to the crown of a healthy tree leads to infection of the latter. If this be the case, it is not difficult to account for the spread of the disease by considering the chief possible methods of propagation in similar cases, *viz.*, through the air under certain favourable circumstances, by human agency, especially in cases where the diseased parts of the plant are habitually

¹ E. J. Butler. The Bud-Rot of Palms in India. Mem. of the Dep. Agricult. in India, Vol. III, No. 5 (1910), p. 221-280. 5 pl. and 1 map.

² E. J. Butler. Report on Cocoanut Palm diseases in Travancore. Bull. Agric. Res. Inst., Pusa, No. 9, March 1908.

handled by persons who afterwards come into contact with susceptible portions of healthy trees, *e.g.*, by those who cut the leaves or draw toddy, finally by birds and insects conveying infectious matter on their bodies.

Of the four species of palm common in the Godavari Delta only three were attacked, the Palmyra (*Borassus flabellifer*), the Cocoa-nut (*Cocos nucifera*), and the Beetlenut (*Areca catechu*), whilst the wild Date Palm (*Phoenix sylvestris*) so far as has been observed, remained immune. By far the greatest mortality was noticed amongst Palmyras; Cocoanuts have suffered much less, and Arecanuts are even less liable to attack than Cocoanuts. That the Cocoanuts suffer much less seems to depend in large measure on a natural resistance presented by this species to the parasite. No experiments have been carried out to investigate the susceptibility of the Areca to attack.

Though palms of all ages are liable to the disease, the majority of cases are mature trees. The intensity of the disease varies enormously in different places.

From experiments conducted by Butler we are allowed to conclude that the fungus is capable of killing moderately sized palms in from 5-10 months from the date of first attack. Speaking of death in this connection we are to understand that period when the central shoot, formed of the innermost, partly expanded leaves, withers and dies. The time which elapses between the death of the central shoot and the loss of all the leaves of the crown is much longer. It appears that 3 years or more may pass before all the leaves have fallen.

With regard to the seasonable prevalence of the disease there are villages in the area mentioned which do not show any marked period of maximum intensity, whilst the deaths are more numerous in the villages of Amalapur Taluk in the months from August to February, than from March to July. "This is in close relation," says Butler, "with the relative humidity of the two periods, and applies equally well to the other affected Taluks. There is a less close relation with the rainfall. In the monsoon, especially in its second half, the mortality appears to reach its maximum, but it is high also in the cold weather months of heavy dew and ground

fogs, when there is usually little rain. A distinct diminution in the mortality is observable in a good many instances after the cessation of the monsoon, followed by the cold weather recrudescence. This is not general, since a few cases can be quoted where no diminution after the rains occurred."

In its earlier stages the disease is usually confined to the large fleshy leaf-sheaths which encircle the apex of the palm. As the outermost of these are exposed to light and air and, consequently, brown and dry, and moreover partially hidden by the cut bases of older leaves, it is not possible to detect the spots on the outer sheaths in standing trees. In such cases the first indication visible is the withering of the central shoot or of one of the expanded leaves. In certain cases the parasite also occurs on the leaf-blades and even on the petioles, and sometimes the top of the stem is also affected. "The spots on the leaf-sheaths vary much in size, from only just visible to six inches or more across. In the inner sheaths they are white at first, becoming brown or reddish later on. On the outer sheaths they may eventually be black. A very early result of the attack is the collapse of affected cells, which leads to the spots being sunk below the level of the surface of the rest of the sheath. The margin of the depression is usually bounded by a raised rim. The early spots are dry and hard and may either be quite free from any external parasitic growth or covered with a white mycelial web. Later on, particularly in the soft heart of the bud, the diseased areas are invaded by numbers of saprophytic organisms, bacteria, moulds and insect larvæ, and the whole is converted into a foul-smelling rotten mass. On the leaf-blades the spots are usually smaller than on the sheaths, not often exceeding an inch in diameter on individual segments. They are straw-coloured in the centre and bounded by a broad dark-brown margin."

The body of the fungus consists of hyphæ forming a mycelium, which may be entirely buried in the palm tissue or may be partly superficial, where it frequently develops a thick white felt over the disease-spots. The hyphæ measure on an average $5-8\mu$. They are unseptate except in rare cases, especially near where the organs of reproduction are formed. Within the tissues they occur in the

intercellular spaces or between adjacent cells and derive their food from the living cells by means of haustoria. The parasite is found in all parts of the leaf, excepting the bundles and bands of sclerenchyma. The reproductive organs arise from the superficial hyphæ. They are of two types, sporangia and resting conidia.

The sporangia are formed terminally on the main branches of the mycelium or on short or long stalks borne laterally on these. They vary much in size and shape. On an average they measure 50 by 35 μ ., extremes 38-70 by 33-42. Poor cultures show even smaller ones. The shape is typically pyriform. The narrow end of the ripe sporangium is papillate. There are four types of germination, which must be considered as modifications of the one process: (1) The apex of the papilla swells up into a very thin gelatinous vesicle. The protoplasm of the sporangium passes into the vesicle in a uniform granular mass, forms a number of zoospores by segmentation. The wall of the vesicle ruptures and the ciliated spores escape. (2) Segmentation into zoospores occurs within the sporangium. No vesicle is formed, but the papilla dissolves, or if a vesicle is formed, it ruptures almost immediately. When an opening is formed, the protoplasm escapes and breaks up at once into free zoospores. Intermediate types between this and the foregoing are met with. (3) The zoospores ripen within the sporangium but, on the opening of the papilla, are not able, from one cause or another, to escape. They come to rest after a variable period of movement, round off, become clothed with a wall, begin to germinate and pierce the wall of the sporangium. (4) No zoospores are formed. The sporangium germinates by putting out one or several germ-tubes.

The zoospores measure from 8-10 μ after they come to rest and assume a spherical shape. They germinate rapidly by one or sometimes two germ-tubes.

The second mode of reproduction is by resting conidia. These are spherical, thickwalled, and often yellowish when old. They are formed singly at the ends of usually large hyphæ. Intercalar ones are rare. They measure 25-40 μ in diameter, the wall being up to 4 μ thick. The stalk-hypha shows great variety as regards size,

shape, and septation. Germination takes place by a germ-tube which, after a short growth, bears terminal sporangia.

Whilst sporangia are usually found on the attacked plants only during the periods of considerable rainfall or heavy dews, the resting conidia are less common in the rainy season, but very common in the hot dry months. No trace of true zoospores has been discovered.

Butler is inclined to believe that the parasite can pass into a dormant condition actually within the bud of the palm and can recommence activity at a later date, progressing until the growing point falls a prey to the attack and death follows.

There are two ways of fighting the disease. The formation of spores may be checked by cutting off the bud from the stem as soon as the first leaf turns white. Infection of healthy trees can be guarded against by brushing or spraying the outside of the bud below the expanded leaves with a fungicide.

The following suggestions were made for an organised campaign against the disease by Butler in 1906.

“A special staff is required, for it is certain that, at first at least the villagers will be slow to take measures for their own protection. If, however, the results bear out the value of the work, real co-operation may be expected before long. A number of expert palm climbers (such as toddy drawers) should be selected under the charge of an agricultural inspector or some similar official and provided with small axes or saws. They should be instructed to climb all diseased trees, both those in the early stages and those already dead, and to cut off the green tops below the swelling of the leaf sheaths. It is particularly essential that all trees in the early stages should be dealt with, and these can be recognized, where the villagers themselves are unable to do so, by the whitening of one of the leaves towards the centre of the head. After cutting off the heads, the whole of the tops should be collected into a heap in each village and burned. In this way every dead or attacked palm in a selected area would have its power of spreading infection destroyed by burning the diseased parts, and this measure alone, if steadily pursued, is certain to give good results. The infectious matter is confined to the head of the palm and, as the tree is

doomed once the disease appears and will yield no further profit, its removal costs little but the actual expense of labour in cutting it down and burning it. To save healthy trees within the affected districts in places where they are surrounded by large numbers of dead or dying trees, is difficult unless the above measures are very thoroughly carried out. But the chances of their infection may be very largely diminished if they are brushed with Bordeaux mixture on the leaf sheaths when the removal of diseased trees commences. Bordeaux mixture is a substance which adheres strongly to the surfaces of plants and being poisonous to fungus spores, it prevents their germination or kills the young germ filaments as soon as they appear. A second gang of toddy drawers should be employed for this work and provided with small vessels containing the mixture and mops of rags for brushing it on to the sheaths. The expanded leaves need not be brushed, but only the leaf sheaths below these. The men employed for removing diseased trees should not be allowed to climb healthy ones, as there is some danger of their conveying the infection on their persons or axes. "To prepare 50 gallons of the mixture, weigh out 6 lbs. copper sulphate, break to powder and dissolve in 25 gallons of cold water by suspending in a piece of gunny sacking in the water. The latter must not be contained in a metal vessel but in a barrel or big earthenware pot. In another vessel weigh out 4 lbs. of fresh quicklime. Slake this gradually till it falls to powder and then, add water up to 25 gallons. Allow it to cool. When cool, add to the copper sulphate solution through a sieve so as to retain any lumps. A thick bluish liquid results which on standing throws down a bluish precipitate, leaving the other part of the liquid clear. To test if fit for use, add a few drops of Ferrocyanide of Potassium to a small quantity of the clear liquid in a dish. If a brownish precipitate appears, more lime must be added till no precipitate is given on testing. Or a clean steel knife may be dipped in it, and if more lime is necessary, a deposit of copper will form on the knife. If none is found, it is ready for use. Stir well before using."

Since the time these suggestions were made, a large campaign

against the disease has been in continuous operation in the Godavari Delta and since January 1910 it is believed that, in spite of many and great difficulties, every part of the infected area is being systematically dealt with. There is no doubt that there has been no slight diminution in the disease within the area of the operations.

The Palmyra Palm in the Tamil Language.—Ferguson has collected a number of proverbial sayings and illustrations from a volume of Tamil proverbs, published by P. Percival. Many of them are so characteristic of native life in India and interesting in themselves that we consider it worthwhile to reproduce the whole. Fibre used as toothpick—a hit at a spendthrift: “He whose father possesses a thousand Palmyra trees has not a fibre to pick his teeth.”—Sharpness of the petiole: “What he saw was a snake but what bit him was the stalk of a Palmyra leaf.”—Leaves young and old, illustrative of heirship and succession: “It is said that the young leaves of the Palmyra-tree laughed because the dry leaves fell off.”—Tenacity with which fruit clings to the tree: “Will the Palmyra fruit fall because a crow alights on the tree?”—Size and weight of the fruit: “Can Palmyra fruit be suspended from the neck of a little bird?”—Tenderness of the germ-taking unnecessary trouble: “Why use a mallet and wedge for splitting the newly germinated root of the Palmyra, that may be split by the hand.” Height of absurdity: “As the scorpion stung the Cocos tree, the Palmyra swelled in consequence.” Felled timber—removal of obstacles: “As an ass perambulated the place where Palmyra-timber has been felled.” Falling from a Palmyra-tree—injuring a fallen man: “A snake bit him who had fallen from a Palmyra-tree.”—‘Yorkshire, though in London’: “The fox of the Palmyra-tree is said to have deceived the fox of the City.”—Avoid even the appearance of evil—toddy-drinking discreditable: “If you drink under a Palmyra-tree, it will be regarded as toddy.”—Palmyra-tree insufficient for shade: “Is the shadow of the Palmyra-tree a shade, or is the friendship of the malignant friendship.”—Rustling of leaves—effects of long experience: “Will the fox of the Palmyra grove be frightened by the rustling of leaves?”—‘Tell that to the marines’: “As one

ascended a Palmyra-tree, and descended without touching the blossom."—The habit of drinking toddy cannot be concealed: "He who drinks milk will belch milk and he who drinks toddy will belch toddy."—Eating a Palmyra-tree—effects of perseverance: "By eating slowly, even a Palmyra-tree may be eaten." How the fruit falls: "The fruit of the tree will fall at its foot."—Young trees—to save your property you must take care of it: "Preserve young Palmyras by cutting, and buffaloes by tying."—Turning the tree to a bad use: "Is it to drink toddy you have reared the Palmyra-tree?"—Witchcraft and basket-making easy arts: "Witchcraft is the easiest of all arts, and the common ola basket is the easiest of all plaits."

THE 'TALA VILASAM'.

There are many descriptions of the Palmyra Palm and its uses: written in the various European languages, and nearly all of them mention a Tamil poem, entitled 'Tala Vilasam', which is said to enumerate no fewer than 801 different purposes to which the Palmyra may be applied; and if the writer is possessed of a good imagination, he invariably adds, that the poem in question by no means exhausts the catalogue.

I searched a long time for that poem, of which nothing but the title seemed to be known, and when I found it at last, I was astonished that I had not discovered it sooner. William Ferguson had given a first translation of it about 60 years ago in the appendix of his interesting little volume on the Palmyra Palm of Ceylon.

The poem was written by "Arunachalam, a Poet of Terrukudantei, the same with Combaconam in the Province of Tanjore."

As the poem is a truly oriental production with the merits and defects of eastern conception, we trust that our readers will not object to our reproducing the poem in extenso, though it may contain a good many repetitions of what has been said above. The fact that it has been translated by a Tamil native accounts sufficiently for the peculiarities of its English style and wording. As we could not procure a copy of the original, we prefer to give it as it stands.

TALA VILASAM.—ON THE PALMYRA TREE.

Invocation of Ganesa.

I invoke Ganesa to help in my composition of the work on the Palmyra tree, in the species of poetry called Kali Venpa, and in presenting the same to the people on the sea-girt earth.

O thou lady, resembling Laksimiy who is seated on the beautiful lotus ! Thou of sweet expressions whose breasts are under stays, and whose person resembles a peacock ! hear me tell you in brief an account of one out of the eight hundred items of things connected with the Palmyra-tree, which is emphatically the Kalpa-tree of the earth.

The various productions of earth created by Brahma came short of men's wants ; and there was wanting one substance which had an entire power of assuaging hunger, removing disease, feeding the illiterate and enriching the house ; and therefore the people of the earth were as unfixed (in all their worldly prospects) as the water on the leaf of a lotus, made poojas and prayed to Sivan for assistance. Sivan heard their prayers and asked of Vishnu with displeasure the reason of his not having daily attended to his duty of preservation ? To which Vishnu, in great obeisance, with one arm folded and the fingers of the other put upon his under-lip replied : there is no fault in my course of duty, but the present amount of things created on the earth by Brahma is insufficient. Upon which, Sivan, in great displeasure and anger, looked at Brahma and asked of him the reason of his not having created things to satisfy all the wants of the people of the earth. Brahma trembled and perspired (through fear) and putting his fingers under his under-lip (as a sign of great respect to a superior) and in faltering language, replied : ' My Lord, who is the operative cause and immaculate ! What I have already created is all that I knew.' Parvathi (Sivan's consort) then said to Sivan : ' There is fault neither in Vishnu nor in Brahma,' and thus appeased his anger. Sivan, upon this, after meditating in his own mind, said to Brahma : ' Hear me tell you something to supply the wants of the people of the earth. Create the Kalpa-tree upon the earth

also.' At the direction of the crescent-moon-adorned Sivan, Brahma created in abundance Palmyra-trees in the three countries of Panathar, Panyoor and Panangasdoor, and called Palmyra-trees by the names of Pootpady, Ponthy, Panay, and Talam. Let me now tell you the various produce and uses of the Palmyra, much extolled by the people of the earth.

If you carefully turn up the ground by hoeing, hedge it, and bury Palmyra-stones in rows at the distance of eight spans one stone from the other, they will return favour, and will never fail, just as the renown of the wise of spiritual blessing will not. When the stones sprout and become tender plants, if you take good care of them not to let the goat, sheep, cow and wild cow feed upon the plants, they will grow in strength, and with the swords of their stems, armed with indented jags on both their sides, they will destroy the iron age of poverty and protect the earth. When the Palmyra tree grows to the height of two bones length, the roots of the stem that fastened the tree will get dry and fall off in season. A female child and a Palmyra tree, if carefully nurtured, will become fruitful in their tenth year. The principle of the blossom (of the Palmyra tree) develops during the months of November and December; the blossom shoots forth as hoarded treasure for the time of exigency in the months of January and February; and then the tender fruits are formed; and of these tender fruits some do fall from the trees out of season. People collect and cut them to pieces, and give them to the cows to eat. Sins may thus be removed, and the cows will give plenty of milk. When the tender fruits of the tree have become larger, they are some of them separated from the trees, the integuments and the adjacent parts are pared off, and the pulpy kernel within is drunk by the people. The drink will remove various diseases, *simulque supprimet vires gonorrhœæ*. Had the celestials and the anti-celestials ever tasted of the pulpy kernel, they would never have gone to churn the milky ocean. When the fruits approach towards ripening, they are some of them separated out of the trees, and laid in the sun for a while; the pulp is then pared and boiled in cocoanut milk mixed with the husked seeds of pulse, and is then eaten. When the fruits have become well ripened,

they fall from the trees, give an agreeable odour; the integument is severed, the fruit is then roasted in fire, washed in pure water and the skin is peeled off. Press the fruits with the hands and swallow the pulp of it; even honey, milk and sugar will not resemble the pulp in sweetness: the fruits may also be sprinkled with reserved Palmyra pulp-water and then be used. Also the pulp is expressed, mixed with rice flour, boiled in oil or ghee, and then used as sweet cakes. The Pandal is made in a suitable place, and a certain spot near the Pandal is nicely daubed with cow-dung. Poojah is offered to Ganesa, his aid is implored, and then the ripe fruits are washed in water, broken by beating with a wooden mallet, and the skin is peeled off; the fruits are then put in Kadaca-baskets, reserved Palmyra pulp-water is poured in, well pressed with the hands; the stones are carefully expressed, and put in another Kadaca-basket and undergo a similar process a second time; the stones are then thrown out in a heap; the fibres of the fruits that lie blended with the expressed pulp are carefully separated by a brush, made of the twigs of certain shrubs; the pulp is then poured upon a mat about twelve cubits long which is spread on a Pandal; well spread over the surface of the mat, and left to dry in the sun during the day time; in the evening the mat is folded, in the following morning it is unfolded. The above mentioned process is continued for about eight days, and when the pulp has become well dried and an inch deep, salt and pieces of Perandi-shrub are sprinkled over, lines are drawn with a weed hook (or sickle), or a like instrument at the distance of a span from one another, the dry pulp is pared off from the mat, and then left to dry for a day more in the sun; the square pieces of dried pulp are then folded, put in a Kooday-basket and laid over a Paran-shelf, to be smoked and to serve for future use.

Hear me, O Lady, the process of dried pulp which a rich man would use. In the pulp expressed from good edible Palmyra-fruits, powder of Palmyra-jaggery and ghee are put, and the pulp is then as before spread over the mat, and when the dried pulp gets half an inch deep, it is as before pared off and reserved for time of want. Another process of preserving dried Palmyra-pulp is the following: the dried Palmyra-pulp is cut into small pieces and steeped in

Palmyra molasses, mixed with roasted powder of pepper, sesamum seeds, rice, and cummin; preserved in an earthen pot, the mouth of the pot is well luted, and then these sweet cakes are used by the country people in their feasts. Hear me again: the pulp that is expressed out of the Palmyra fruits that fall scantily in the latter part of the fruit season, is spread over the mat for two days and left to dry very well; the dried pulp is then peeled off into sheets. An offering of cakes made of the flower of the edible Palmyra roots and of dried Palmyra pulp, together with other fruits, is made in Palmyra plantations to Ganesa. The dried Palmyra-pulp that was preserved is protected without contracting grubs that may spoil it, if the owners are devoted to Ganesa during the time. The dried Palmyra-pulp that it thus preserved may better serve the people as food during the rainy season. Griping of the bowels, diarrhoea and lodging of small fish bones in the œsophagus may be removed by eating dried Palmyra pulp. The stones of the Palmyra fruits that are eaten, and of those that are expressed, are divided into four sorts, put in the ground into beds of 4, 5, 6 or 8 layers, covered with earth, watered twice during the months of August and September and the edible Palmyra roots are dug out in the months of January and February. When there is no rain the skin of the root is peeled off, its head is pared away, the root is cloven into halves, its foot is nipped out, left to dry in the sun, the foot is nipped off in the second and third also, the halves are carefully stirred up to dry well, and then collected and preserved. Such dried edible Palmyra roots are powdered and sifted, salt-water is sprinkled upon the flour, fish, herbs, and other fruits are added to it and mixed together, the paste is then put into a conical Olabasket and steamed; the poor people eat much of it and get strength.

If the flour of the dried edible Palmyra-root (Odia) be mixed with Cocoanut milk, salt-water and fish, and if the paste be steamed, the cake when eaten will daily add strength to any body. The middle pieces of the Odia are cleared of their outer fibrous skin, soaked in water, then dried and powdered; if the flour be mixed with the cocoanut milk, salt-water, fish and herbs, and if the paste be steamed and then ghee be added

to it, the cake will indeed be very sweet; if certain fruits and pungent substances be added to the above, the cake will be of an agreeable taste. If the Odial flour be mixed with the scrapings of the kernel of the cocoanut, and powdered rice, cummin, pepper and chilly; if the paste be steamed and the cake be broken and dried, it can be preserved for two months. No other cakes will resemble the above. Sweets are more agreeable to cakes of the above description. If curds, milk, ghee, and cocoanut milk be added to the paste of the Odial flour, and be steamed, the cakes, when used, has the power of *retinendi seminis virilis in corpore sine pollutione, conferendique facultatem horas in thalamo jugali protrahere*, and increasing muscular strength; the person will not be reduced by labour.

I shall now tell you, Lady, of the different kinds of gruel made of the Odial flour; in the boiling water in which fish, chillies, lobsters, acid, grits of rice, have previously been put, in proportion, by little quantities, the Odial flour; stir it, and when it gets boiled and reaches a proper consistency, take the vessel out of the hearth and use it; if certain healthful (*i.e.*, that contributes to the improvement of one's health) fruits be added to the above, anybody may use it. If in water, salt and grits of rice and small fish be put first, and when they get boiled, if Odial flour, mixed with acid and powdered chillies, be poured in and properly stirred, the gruel infused, will be a very healthful one; if herbs and certain fruits be added to the above, the gruel will be a very good one. The people, when they dig the edible Palmyra roots, take some of them and roast in the fire, remove the outer covering and then eat the roots by mastication. If the roasted roots be exposed to the dew and be eaten on the following morning, it will be very nice indeed. The edible Palmyra roots are boiled by steam in water and eaten; also such boiled roots are like the Odial mentioned before, dried in the sun and preserved for future use. The accompaniments that are to be taken with roasted and boiled edible Palmyra roots, are cocoanut, salt,—and pungent substances.

People may eat the sprout that just shoots forth out of the Palmyra stone; the stone, in a certain stage, may be roasted in

the fire, then be broken and the kernel be eaten. There is no comparison to the curry or broth made of very tender edible Palmyra roots and cocoanut milk. The kernel that is formed in the Palmyra stone in its advanced stage will be very sweet.

Hear me now tell you the use of the Palmyra stone shell. It will ever serve as fuel for cooking; if the shell be partially burned and the inner coat of the shell be removed, it will serve as coals to smiths; it will also serve as a powder box, tinder box and a pill-vial.

When the Palmyra tree puts forth blossom, it is rendered fit for yielding the juice by pressing it between two poles, and by beating it with the handle of a knife; its end is properly incised, a vessel is adjusted to it, and toddy is collected; if the toddy be presented in Poojah to Sacti, excellent boons may be obtained. Toddy if drunk, *excitabit amorem et cupidinem in illis, qui in rem uxoriam incumbunt*. If taken daily, it will increase one's muscular strength and give a gloss to his person; if used by children in small quantity it will remove itch and many other diseases. If powdered load-stone and scoria of iron and file be put into the pot that is attached to the incised blossom, and the toddy collected in such a pot be drunk for seven days in the morning—asthmatic affections, bloated cheeks and the like may at once be removed—if, in the morning and evening, the pot that should be attached to the blossom be baked in fire, *qui succum in hac olla collectum bibit diutius in copulatione morabitur*. If shell-lime be put in the pot that should be attached to the blossom, and the toddy be used, hunger, thirst, languor and laziness will be removed, heat in the constitution will be destroyed and coolness be created. Toddy will be very sweet if powdered pepper be put in it and boiled. If toddy be boiled nicely, and if slices of ash-coloured pumpkin be boiled in it—the broth, when it is seasoned and used, will create a wonderful power to the stomach to digest any amount of food. If, when the south-wind blows, toddy be collected, strained and poured in a pot, and be boiled until it gets the consistency and colour of Margosa-oil—then be poured either in a new pot or a vessel of Palmyra leaf, the mouth well covered, and the vessel be then exposed to smoke or buried in the earth—the

Palmyra molasses will be candied (*i.e.*, crystallized) : these crystals, if taken into the mouth, will suppress asthma and phlegm.

If the boiled toddy in the above process be still boiled until it sticks a little to the bottom of the vessel and bubbles are formed, you can have Palmyra sugar.

If toddy be so boiled that, if it be taken in a ladle, it will not be drawn into threads, but will break, take it out of the fire, put a little quantity of rice flour and mix it well with the molasses and pour the molasses in pots and little Ola cases; you will have Palmyra jaggery.

If, in the above said stage of consistency, powdered cummin, pepper and sesamum seeds all well roasted be put in the molasses, and if you steadily continue mixing and agitating the molasses, you will have a powder, which may be used to assuage thirst; such a powder, if it be of the toddy of a male Palmyra tree, may be taken as medical accompaniments; may also be given to motherless babes. If the proper consistency be not pitched, it will get as hard as sugar-candy.

When toddy ceases to be drawn by the close of March, there will be fruits during the following five months, and during the remaining months there will be dried Palmyra pulp. So, the produce of the Palmyra tree is had in every month of the year. The Palmyra-tree is able to bestow bountifully, and one may eat of its produce in the three seasons of meal every day. The mind will ever love it more than any other thing. If a person only with gratitude to the tree eat of its produce twice or more a day, he will have all the benefits of those that spend the day in fasting and devotion and eat only once a day.

Old Palmyra branches are cut out of the tree every other year, left to dry in the sun a day, made flat by pressing them in a certain manner, and then used for covering and fencing. When the Olas get mouldered, they are used for manuring rice-fields, etc. The inner fibrous bark of the Palmyra stem is used in making cords and ropes, etc., but the outer bark is not so strong as the inner. The Palmyra stem is used in making cots, hedging, and covering an ola book. The white tender Palmyra leaves are used for making baskets of several kinds, as for storing paddy,

for keeping cloths, betels and arecanuts, sacred ashes and other things, for measuring grain, oil and the like, for making cases of several species, for drawing water, and for making mats of different kinds. The ribs of the Palmyra Olas are used for making cords and ropes, winnowing baskets, and brooms, etc. The tender Palmyra leaves are used for making umbrellas, fans, dolls, vessels to eat from, and rolls for the perforated ears.

The Olas are used in writing the Veds, Shasters, and Agamas, in making deeds, conveyances, dowries, and other presents, in writing interest bonds, in drawing magic diagrams, in writing letters to friends at a distance, in drawing accounts.

The names of Palmyra trees are numberless, such as, the white, the tall, the short, the black-fruited, etc. The roots of Palmyra branches that attach themselves to the tree, and the webs that lie interwoven between them, fall off in season, and may be used as fuel. If the several ingredients of the male Palmyra tree be all collected, rubbed into a paste and mixed with cow-milk, *et si aliquis, qui vult cum fœmina rem habere, hoc bibet, ille tempus copulationis protrahere proterit.* The tender pith of the Palmyra tree that lies in the top part of the tree is eaten by the people.

The timber of the tree is used for building temples, palaces, houses, alms-houses and inns; also as wall-plates, beams, posts, door-frames, pegs, laths and the like. The stump of the tree may be made hollow and used for keeping salt. The produce of the tree may procure to some fields, houses, and jewels. Peace of mind may be secured; one may live in prosperity and great renown. The Palmyra stone, though boiled or roasted in fire, will still sprout; it is, therefore, of a superior quality.

The Pandava kings have regained their lost kingdom, because they have eaten Palmyra fruits when in the wilderness. The Pandya King and others are said as having worn garlands of Palmyra blossoms.

ILLUSTRATIONS.—Plate XXXVIII shows one of the numerous groves of Palmyra Palms in the northern part of Ceylon. In the

country round Jaffna the Palmyra is at once the most conspicuous and the most beautiful feature of the landscape. The mature forest reaches a height of one hundred or more feet.

The photograph reproduced on plate XXXIX and kindly supplied by Mr. Phipson shows a group of palms from the Victoria Gardens in Bombay. The leaves of the regular spherical crown of the Palmyra Palm seem to arise from a huge cluster of fruits. At the foot of the Palmyra there is a young specimen of the same species, and to the right of it a Fishtail-Palm (*Caryota urens*) has developed three large bunches of flowers and fruits, of which, however, only one is distinctly visible.

(To be continued.)

A LIST OF INDIAN BUTTERFLIES.

BY

CAPT. W. H. EVANS, R.E.

(Continued from page 584 of this Volume.)

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NEMEOBIDÆ		LIBYTHÆINÆ—contd.				
—contd.:						
Abisara ..	....	echerius. Stoll.	....	Chamba-As. Centr.	= abnormis, M.	Echerius was described from China, but there are no specimens from this locality in the B. M.; prunosa, the southern form, is larger and brighter; the Burmese forms are very puzzling and possibly abnormis ought to be separated, both were described from South Burma.
			prunosa, M..	S. C.		
			angulata, M..	Naga-B.		
			bifasciata, M.	An.		
			kausambi, Fd.	Mergui.		
Stiboges ..	....	nymphidia. But.	....	Bhut-B.		
PAPILIONIDÆ.						
Papilio ..	(Ornithoptera.)	helena ..	cerberus, Fd.	Sik.-B.	.....	The arrangement of the Papilios is that given by Jordan is the Macrolepidoptera. Moore's subgenera are used for the groups defined by Jordan. The long series of each species kept at the Tring Museum form the basis of Jordan's arrangement; the only alterations I have made are under polytes.
			helia conoides, M.	An.		
		aeacus, Fd.	....	Garhwal-B.		
		minos, Gr. .	....	S.		
		darsius, .	....	C.		
		Gray.				
(Pangera.)		aidoneus, Db.	....	Garhwal- Up. B.		
		varuna ..	astorion, Wd.	Kum-B.		
		zaleucus, .	....	B.		
		Hew.				
(Meneles.)		laiohector, L..	....	Beng-S.C.		
		jophon, Gray.	....	C.		
			pandiyana, M.	S.		
		aristolochia, Fab.	....	I.		

Genus.	Subgenus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PAPILIONIDÆ—contd.						
Papilio	(Menelades)—contd.	....	goniopeltis.	B.		
			Roth.	C		
			ceylonicus.M.			
			camorta. M.	Ni.		
(Losaria) ..	coon	..	d o n bledayi.	B		
			Wall.			
			cacharensis.	Cach.		
			But.			
			s a m bilanga.	Ni.		
			Doh.			
			rhodifer.	An.	might be put as	
			But.		race of coon.	
(Byasa) ..	latreillei.	....		Garhwal-		
	Don.			Sik-		
			polla. De N...	Up. B.		
			adamsoni.	B.		
			Gr.			
			crassipes.	B.		
			Ober.			
			nevilli.	Cach.		
			W. M.			
			philoxenus.	Kash-Nep.	lama. Ober, is con-	
			Gray.		fined to W. China.	
					Bing as a var of	
			polyeuctes.	Sik-B.	philoxenus.	
			Db.			
			dasarada.	....	Sik-As.	Bing as a var of
			M.			philoxenus.
			ravana. M. ..	Kash-Kum.	Bing as a separate	
			barata, Roth,	B.	species.	
			plutonium..	pemberton,	Bhut.	
				M.		
(Cadugoides.)	agestor.	....		Sik-B.		
	Gray.					
			govindra, M.	Kash-Kum.		
			epycides.	....	Sik-As.	
			Hew.			
			curtius,	Up B.		
			Fruh.			
			hypochra.	S. B.		
			Jor.			
			siateri.	....	Sik-Up B.	
			Hew.			
			marginata.	Shan St.		
			Ober.			
			tavoyanus.	Ten.		
			But.			
(Chilasa) ..	paradoxus.		telearchus.	As-B.		
			Hew.			
			(d. danisepa.			
			But).			
			clytia. L. ..	....	Simia-B. S.	
					C.	
					.....	Jordan considers the forms of clytia to probably represent local races in the making.
			(v. casyapa.	I.		
			M.)			
			(v. lankeswara.	S. C. Ten.		
			M.)			
			(v. commixtus.	Sik-As.		
			Roth.)			
			(v. onpape.	B.		
			M.)			
			(v. papone.	S. B.		
			Wd.)			
			(v. janus.	S. B.		
			Fruh.)			
			(d. dissimilis.	I. B. C.		
			L.)			

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PAPILIONIDÆ—contd.						
Papilio -contd.	(Chilasa) -contd.	....	flavolimbatus. Ober.	An.		
	(Tamera) ..	castor. Wd.	....	As		
			polias Jor. ..	Sik-Up. B.		
			mehala. Gr.	S. B.		
			S.			
		mahadev a. M.	....	S. B.		
		d r a v i d a - rum. W. M.	....	S.		
	(Papilio) ..	machaon ..	asiatica. Mön.	Bil. Chit- Nep.	Sphyrus Hüb. an European variety.	
			(v. ladakensis M.)			
			sikkimensis. M.	Sik-Bhut.		
			verityi. Fruh.	Up. B.		
		xuthus. L.	....	Up. B.		
		demoleus - L.	....	I. Up. B.		
			malayanus. Wall.	S. B.		
	(Charus) ..	demolion . Cr.	....	Ten.		
			liomedon . M.	S.		
		noblei. DeN	....	B.		
		chaon. Wd.	....	Nep-B.		
			d u c enarius, Fruh	Ten.		
		helenus L.	.. .	Muss.-B.	.....	Jordan gives sakontala and walkeri as separate species in the helenus (charus) group: of walkeri only one specimen is known and of sakontala very few, but there are also several aberrations of polytes known. that are neither sakontala or walkeri: under the circumstances would it not be better to sink all these specimens as aberrations of polytes. No doubt the male organs of walkeri and sakontala are very different to those of polytes, but is not this rather to be expected with aberrations.
			daksha M. ..	S.		
			mooreanus. Roth.	C.		
		i s w a r a White.	...	Mergui.		
		fuscus ..	prexaspes Fd.	B.		
			andamanicus Roth.	An.		
		hipponous.,	pitmani. El & DeN.	S. Ten.		

Genus. Sub-genus. Species. Race. Locality. Synonyms, &c. Notes.

PAPILIONIDÆ—contd.

Papilio— contd.	(Laertias)... polytes	.. romulus Cr.	I. B. C.	=sakontala Hew, Jordan confines polytes to China, walkeri Jan, casual aberrations polytes, L. China.	giving the Indian race as romulus, the name under which the hector like females were described, while polytes was used for the aristolochiae like females. I propose here to employ stichius for the latter form of female though up to the present it has only been used for the females of this form that have no spot in the cell of the hindwing. The female resembling the male stands as cyrus.
		(Female d. cyrus, Fab). (Female d. stichius Hüb) nikobarus. Fd. (Female d. stichioides, Ev).	An. Ni.		I propose the name <i>stichioides</i> for the aristolochiae like females from the Andamans and Nicobars, where the romulus form does not occur.
	(Iliades) .. polynnes-tor Cr.	.....	Sik-S.		
		parinda M.	C.		
	mayo. Hew.	.....	An.		
	memnon ..	agenor. L.	Sik-B.		
	protenor Cr	.....	Kash-Kum. Sik-B.		
		euprotenor. Fruh.	Kum-B.		
	rhetenor Wd.	....	....	Form with a dorsal white patch on the forewing above.	
	(Mimbyasa) janaka. M.	....	Muss-Sik.	.....	Moore places janaka and bootes in Byasa with latreillei, etc: I propose <i>Mimbyasa</i> as the sub-genus for these two species.
	bootes. Wd.	....	As.		
	(Achillides) elephenor. Wd.	....	Up. As. Naga.		
	dialis ..	schanus. Jor.	S. Shan St.	=doddsi. Janet, Tonkin, described from Tonkin.	
	bianor ..	gladiator. Fruh.	S.B.	.....	Seitz records P. demetrius Cr. (=carpenterii but) from N. India, but this seems to be an error.
	polyctor Bdl.	....	Chit-Nep.		
		ganesa. Db.	Sik.		
		triumphator. Fruh.	As.		
		significans. Fruh.	S. B.		
	paris. L. ..	....	Kum-B.		
		tamilana. M.	S.		
	areturus. Wd.	....	Nep-B.		
		arius Roth ..	Kash-Kum.		
	krishna M.	Sik-Up. B.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c. u s.	Notes.
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PAPILIONIDÆ

—contd.

Papilio	(Achillides)	crino, Fab.	Beng. S.	montanus, Fd. an.	
—contd.	—contd.				ab.	
		fruhstorferi,		C.		
		Rob.				
		b u d d h a ,	....	S.		
		Wd.				
		palinurus.	....	B.		
		Fab.				
(Pathysa)	..	eurous	..	cashmirensis, Kash-Kum.		
				Roth.		
				Sikhi m i c a.	E. Kum-As.	
				Heron.		
		glycerion,	....	Sik-up B.		
		Gray.				
		agetes, Wd.	....	Sik-B.		
		n o m i u s,	....	Sik-S. C.		
		Esp.				
		swinhoei.	M.	Up As-B.		..
		aristeus	..	a n t i c r a t e s,	Sik-As.	
				Db.		
		hermocrates.		B.		
		Fd.				
		antiphates. pompilius,	Sik-B. S.	antiphates, Cr.,		..
		Fab.		China, alcibiades,		
				Fab., Java.		
		naira.	M.	..	Trav.	
		ceylonicus,		C.		
		Eimer.				
		epaminondas,		An.		....
		Ober.				
(Meandrusa)	gyas.	Wd.	..	Sik-As.	SB.	
		aribbas,		Up. B.		
		Früh.				
		payeni	..	evan, Db.	Sik-As.	
		amphis,	Jor.	B.		
(Zetides)	..	cloanthus,	....	Kash-B.		
		Wd.				
		sarpedon L.	....	Him-B.		
		teredon,	Fd.	S. C.		
		doson,	Fd.	....	C.	Jordan, sic; he rejects jason, L.
						Jordan separates eurypylus and doson on the male organs; superficially eurypylus differs in that on the underside of the hindwing the dark sub-costal band is usually posteriorly united to the dark sub-basal band and does not end inside the silver band; if the two dark bands are not united the basal margin of the silver band is notched at the sub-costal vein. There are several specimens of cherouns in the B. M. over the label "acheron, Früh."
		eleius,	Früh.	S.		
		axion,	Fd.	Kum-B.		
		eurypylus..	cheronus,	Sik-B.		
			Früh.			
		macronius,		An.		
		Jor.				
		bathycles	..	chiron, Wall.	Sik-B.	
		agammem-	....	Kum-B.		
		non, L.				
		menides,		S. C.		
		Früh.				
		andamana,		An.		...
		Lathy.				

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PAPILIONIDÆ						
" —contd.						
Papilio —contd.	(Zetides) —contd.	....	decoratus, Roth.	Ni.		
	(Par a n't i- copsis).	macareus..	indicus, Roth.	Sik. Bhut.		
			lioneli, Fruh.	As.		
		xenocles, Db.	gyndes, Jor.	B. As		
			phrontis, De N.	E. Kum.- Bhut.		
			kephisos, Fruh.	B.		
		megarus, Wd.	....	Sik.-B.		
			similis, Lathy.	Shan. St.		
Leptocir- cus.	....	curius, Fab.	....	Naga H.-B.		
		meges ..	virescens, But.	B.	meges, Zink., Java.	
			indistincta, Tytler.	Naga H.		
Teinopal- pus.	....	imperialis, Hope.	....	As.-Up. B.		
			himalaicus, Roth.	Nep.-Bhut.		
			imperatrix, De N.	Taungoo.		
Armandia.	....	lidderdali, Atk.	....	Bhut.-Up. B		
Parnassius.	(Parnas- sius).	jacquemontii, Bdl.	....	Kash.-Kum	=himalayensis, El. Stichel gives Parnassius stub- bendorfi tartarus from Kashmir but the locality seems very doubtful.	
			impunctata, Aast.	Sik.		Fruh. gives the Sikkim form of jacquemontii as himalayensis, but this name was used by Elwes for what is now called jacquemontii: the only form described from Sikkim is im- punctata; there are no Sik- kim specimens in the B. M.
			chitralensis, M.	Chit.		
		cranus, Ober.	....	Kash.-Kulu.		
			sikkimensis, El.	Sik		
		hardwickii, Gray.	....	Chit.-Kum.		
			viridicans, Fruh.	Sik.		
	(Koramus).	delphius ..	chitralica, Verity.	Chit.	hunza. Cr., Hindu Khush.	
			stenosemus, Hon	Kash.		
			stoliczanus, Fd.	Lad.-Kulu.	atkinsoni, M. a fe- male ab or var.	
			lampidius, Fruh.	Sik.	=whitei, Bing.	
	(Tadumia).	acco, Gray.	....	Lad		
			gemmifer, Fruh.	Sik.		
		simo, Gray.	....	Lad,		
			accanus, Fruh.	Sik.	=moelleri, Bing.	
	(Kailasius).	charltonius Gray.	....	Chit-Sik.		
		imperator.	augustus, Fruh.	Sik.		
Hypem- nestra.	....	helios ..	maxima, Lang.	Bal.	=balucha M. heli- os, Nick., Persia.	

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PIERIDÆ.						The arrangement of the Pieridæ differs little from that given by Bingham. Ixias is placed after Appias.
Leptosia ..	....	x i p h i a , Fab.	....	I. B.		
		nicobarica ..	Ni.			
Delias ..	(Piccarda).	a g o s t i n a , Hew.	....	Sik.-B.	Fruh. sep infumata, As-B.	
		singhapura agoranis, Gr.	S, Ten.			
		hyparete ..	hierte, Hüb...	E. Kum-B.		
			ciris, Fruh...	S. Ten.	metarete But., Ma- lay Penin.	
			ethire. Doh..	Beng-N Ma- dras.		
		e u c h a r i s , Drury.	....	I. B. C.		
		descombesi leucacantha , Fruh.	Sik.-B.		descombesi, Bdl, Co- chin China. Fruh. sep female vars auriga and leuco- gæa.	
(Delias) ..	belladonna, Fab.	....	Kulu-Kum.	.....		The forms of belladonna are puzz- ling: typical belladonna occurs throughout its range, but from Sikkim Eastwards it is rare; ithiela being the common form: sanaca flies with belladonna in the W Himalayas and so cannot be regarded as a seasonal form, it grades to belladonna and so cannot be regarded as a separate species though considered o by some authors.
		(v. sanaca, M.)				
		ithiela, But.	Sik.-B.		Fruh. sep berinda M., As and pers- ica Fruh., Up. B.	
		aglaia, L...	....	Sik.-B.		
		beata, Fruh.	Ten.			
		thysbe ..	pyramus, Wall.	Sik.-B.		
			kandha, Doh. N. Madras.	thysbe, Cr., China.		
Prioneris..	....	thestyli, Dn.	....	Muss-B.		
			j u g u r t h a , Fruh.	Ten.		
		sita, Fd. ..	....	S. C.		
		clemanthe, Dh.	....	Sik.-B.		
Anaphaeis..	....	mesentina, Cr.	....	I. Ni.		
			taprobana, M.	C.		
Baltia ..	....	shawii, Bates.	....	Chit-Lad.	.....	I have seen a Baltia caught in Sikkim: it is very close to but- leri. The Indian form of shawii is larger and lighter than Central Asian specimens but the B. M. material is very scanty.
		butleri, M.	....	Lad.		
			s i k k i m a , Fruh.	Sik.		
Aporia ..	(Aporia) ..	soracta, M.	....	Kash.-Kum.	?=denigrata. Fruh. Pun?, N.W.F.	

Genus. Sub-genus. Species. Race. Locality. Synonyms, &c. Notes.

PIERIDÆ—contd.

Aporia —contd.	(Aporia) —contd.	leucodice..	balucha, M...	Bal-Chit.	.....	A. leechii is a good race of balucha and has nothing to do with soracta. In the B. M. as female balucha are placed several yellow butterflies caught by me in Chitral in quite different localities to those frequented by balucha: they are in fact a form of nabellica and I propose to call them <i>hesba</i> : they vary from nearly white to lemon yellow, more or less dusted with black scales but never so profusely as nabellica often is: the hindwing is rarely dusted with black scales.
			leechii, M...	Hunza-Lad.		
		nabellica, Bdl.	....	Kash-Kum.		
			hesba, Ev. ..	Chit.		
		larraldei ..	harrietæ, DeN.	Bhut.		
	(Metaporia)	agathon, Gray.	....	Nep-As.		
			phryxe Bdl..	Kash-Kum.		
			(v. caphusa, M.) (v. ariaca M.)			
Pieris	.. (Pieris)	.. brassicæ, L.	....	Chit-As.		
		deota, DeN.	....	Kash-Lad.		
		canidia, Sparr.	....	Chit-up B.	.....	In the B. M. the series of canidia from S. India presents a different appearance to the numerous specimens from N. India, though it is not easy to put the difference in words: the Southern form is larger with the black markings more developed especially those on the margin of the hindwing. I propose to call this race <i>canis</i> .
			canis, Ev. ..	S.		
		naganum, M.	....	As-up B.		
		rapae, L...	....	Chit Lad.		
		melete ..	ajaka, M.	.. Kash-Up B.	=montana, Verity (E form) melete Men, China.	Pieris is here extended to embrace certain closely allied genera. melete from China is a large and very distinct form: Indian specimens present a lot of variation, dry season Kashmir specimens being very like napi: melaina from the Chumbi valley is very distinct, but the Eastern form separated by Verity as <i>montana</i> resembles the form from Mussoorie, etc., very closely.
			melaina, Rüb.	Sik- (Chumbi).		
		krueperi ..	devta, DeN...	Bal-Chit Lad.		
(Parapieris)	callidice, Esp.	....	Chit-Garh -	Rüb, Indian race as kalora M.		
	chumbien- sis, Den.	....	wal.	Sik- (Chumbi).		
(Pontia)	.. daplidice, L.	Bal-Chit- Lad.	Rüb, Indian race as moorei.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes
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PIERIDÆ—contd.

Pieris— contd.	(Pontia) —contd. (Synchloe),	glaucophaea, Klug. chloridice, Hüb.	Bal-Chit. Panj. Chit-Lad.	Recorded from Kumaon but probably an error.	
		belia .. daphalis, M..		Chit-Kunawur, Panj.		
	(Anthoeca-lucilla, But. ris).	....	....	Panjab.		
Huphina ..	....	nerissa .. phryne, Fab.		Nep-As.	nerissa Fab. China.	
		evagete, Cr..		I. C.		
		dapha, M. ..		As.-B.		
		lichenosa, M.		An.		
		nadina, Lucas.	....	Sik.-B.,		
		remba, M. ..		S.		
		cingala, M. ..		C.		
		andamana, Sw.		An.		
		lea, Db. ..	....	S. B.		
Appias .. (Tachyris)..	nero.	.. galba, Wall ..		Sik-B.	nero Fab. Java.	
		figulina, But.		Ten.		
	(Appias) ..	lyncida .. hippoides, M.		Kum-B.	Orissa.	
		latifasciata, M.		S.		
		taprobana, M.		C.		
		nicobarica, M.		Ni.		
	libythea, Fab.	....		Panj-Sik.-S. C.		
		zelmira, Cr.		As.-B. Beng.		
(Catophaga) albina ..		confusa. Fruh.		Sik.-B. Beng.	albina, Bdl., Moluccas.	
		(female v. semiflava. Fruh).				
		swinhoei, M.		Centr.-S.		
		venusta, M.		C.	neomba, Bdl., Sumatra.	
		(female flava. Rob.)				
		darada, Fd.		Sik.-As		
		adamsoni, M.		B.		
		wardi, M.		S.		
		yaksha, Fruh.		Poona Dist.		
		paulina Cr.		C.	=lankapura M., galene, Fd., fasciata, Fruh., an ab.	

The arrangement of the Catophaga and Hyposeritia sections of Appias is exactly as given by Fruhstorfer: no doubt the series on which it is based is better than the poor one in the B. M. He states that the melania group differs from the albina group in that the melania males have a broader grey apical patch, formed of big diffused spots. I have placed wardi as a race of melania.

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PIERIDÆ.— <i>contd.</i>						
Appias. — <i>contd.</i>	(Catophaga) — <i>contd.</i>	melania— <i>contd.</i>	galathea, Fd.	An.-Ni.		
	(Lade)	.. lalassia Gr. S.	....	S. B.		
	(Hyposeritia.)	indra, M...	....	Nep.-B. Beng. Poona Dist. S.		
			shiva, Sw.			
			statilia, Fruh.			
			narendra, M.	C.		
		lalage, Db.	....	As.-Naga Hill.	.....	These races of lalage are not very satisfactory: typical durvasa and lalage differ, but both forms meet in Sikkim.
			durvasa, M.	Kulu-Sik.	=pseudolalage, M. confluens Fruh., an ab.	
			argyridina. But.	B.		
			lagela, M.	S. B.		
Saletara ..	....	panda ..	chrysea. Fruh.	Ni.		
Ixias ..	....	pyrene ..	rhexia, Fab..	Kulu-Up-B.	pyrene L., and evippe, Dr., China.	The forms of Ixias are very puzzling and I hope the arrangement given will prove satisfactory: rhexia is the large hill form with a white female and grades with pirenasse the plains form: in South India the prevailing form of male is very like cingalensis, but Ceylon females have the base of interspace 3 yellow. South Indian females are very variable. Latifasciata, the South Burma race, has a very pale dry season form (=pallida, citrina, M.) which Bingham treated as a separate species.
			pirenassa, I.B. (plains) Wall.			
			cingalensis, M.	C.	Fruh.gives females vars conectens and nivescens.	
			latifasciata, But.	S. B.		
			andamaia, M.	An.		
		marianne Cr.	....	Kum-S. C.		
			nola, Sw.	.. Mahabeshwar.		
Dercas ..	....	verhueli ..	doubledayi, M.	Sik-Bhut.	verhueli, Hoev, China.	
			pallidus, Fruh	As.-B.		
		lycorias, Db.	....	Sik.-As.		
			(v. decipiens, DeN.)	....	=brindaba, Sw. ..	
Gonepteryx	....	ramni ..	nepalensis, Db.	Chit-Up-B.		
		zaneka, M.	..	Kash-Kum.		
			zanekoides, DeN.	Up-B.		
			chitralensis, M.	Chit.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PIERIDÆ—contd.						
Catopsilia.	pyranthe, L.	....	I. B. C.		
		forellia, Fab.	....	I. B. C.		
		crocale, Cr.	....	I. B. C.	.....	Fruh. gives many forms of male and female varieties of crocale and pomona but they hardly seem worth retaining; Mr. Bell has proved that these two species have distinct larvæ.
		pomona, Fab.	....	I. B. C.		
		scylla, L.	....	S. Ten.		
Colias	hyale ..	lativitta, M.	Bal-Chit-Kum.	hyale L., erate Esp. Europe.	Röber treats erate and hyale as separate species: Fruhstorfer unites them: lativitta is the erate form which grades with glicia, the hyale form with the spotted border: pallidus is the white form of female.
			(male v. glicia, Fruh.) (female d. pallida, Röb.) (h. chrysodona, Bdl.) nilagiriensis, Fd.	Bal-Chit. S.		
		ladakensis, Fd.	....	Kash-Muss.	.....	I believe that thrasibulus and ladakensis will eventually prove to be races of the same species. Fruh. described phicomone phila from a single male from Kashmir; he has since found that the locality was erroneous.
			berylla, Faw.	Sik.		
		cocandica, Fruh.		Lad.		
		alpherakii, Verity.		Chit.		
		wisko tti, Std.	....	Chit.		
		dubia, El.	....	Sik.	=? miranda, Fruh.	
		stoliczana, M.	....	Kash-Lad.	? race of eogene ..	
			miranda, Fruh.	Sik.		
		eogene, Fd.	....	Chit-Kum.	.....	The eogene group is very puzzling: in the B. M. there are series of eogene from Chitral and Baltistan, agreeing "fairly" well; from the same districts in Ladak there are numerous specimens arranged as leechii Gr. and stoliczana but the forms seem to grade: miranda first recorded by Fawcett as leechii (hence Swinhoe giving Sik. as a locality for the latter) is a very unsatisfactory form, vide Elwes' remarks when describing the form dubia, which probably = miranda. I believe that all are forms of eogene.
			(female d. cana, Röb.) leechii, Gr.	Lad.	? var of stoliczana.	
		fieldii, Mén.	....	As.-Up-B.	.....	The eastern form of fieldii is just like the Chinese form, i.e., true fieldii.
		edusina, But.		Chit-Sik.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PIERIDÆ—contd.						
Terias	.. (Kibreeta)	libythea, Fab.	....	I. B. C.	Fruh. sep fruhstorferi M., As.-B.	
	(Nirmula)	venata, M.	....	I. B. C.	Fruh. sep rama M., S. C. and sikkimica M., Sik B.	
		laeta, Bdl.	....	I. B.	Fruh. sep pseudolacta M., Ten.	
(Terias)	..	hecabe, L.	....	I. B. C.-An. Ni.	.....	Fruh. separates hecabe and silhetana (given as a race of blanda) into a number of races in Lepidoptera Indica 28 "species" are given. I do not see that any good purpose is served by retaining any varieties or races except moorei, whose d.s.f. is as typical silhetana.
		silhetana, Wall.	....	Sik.-B. S. An.	Fruh. as race of blanda M., Java = ? hecabe.	
		moorei, But.	....	Ni.		
		andersoni, M.	....	Muss.-B. ? C.		Andersoni certainly occurs in Sikkin, though Bing. doubted it. Sari is recorded from S. India and Ceylon: the only specimens in the B. M. marked as such are two from Ceylon which may be andersoni, but are certainly not sari.
		sari, Hors.	....	Ten.	Fruh. Indian race as sodalis, M.	
(Gandaca)	..	harina	..	assamica, M. Beng. Sik-burmana, M. up B. andamana, M. S. B. Ten. An.		
Colotis	.. (Colotis)	.. calais, Cr.	....	Panj. Sind, Cutch.	= dynamene, Klug.	amatus constantly differs from calais in that the black spot on the margin near the dorsum is not detached and quadrate. The dimorphic white female of amatus does not seem to have been named: I propose to call it albina.
		amatus, Fab.	....	I. C.	= modesta, But., cypræa, Fab.	I have omitted phisadia, God., as the only record of it is one specimen from Mooltan, which very likely was a hybrid between vestalis and protractus: similar hybrids have been recorded from Karachi.
		(female d. albina, Ev.)	....		
		protractus, But.	....	Bal.-Panj. Cutch.		
		vestalis, But.	....	Bal. Panj.-Central I.	= puellaris, intermissus, But.	
(Madais)	..	fausta, Oliv.	....	Bal. Panj.-Bombay.		
		fulvia, Wall.	..	S. C. Beng.	= tripuncta, But.	
(Callosune)		etrida, Bdl.	....	I.		
		limbata, But.	....	C.		
		eucharis, Fab.	....	Centre I.-S. C.		
		danae, Fab.	....	Bal.-S. C. Central I.	= subrosens, S.W., dulcis, But.	The form of danae from Sind is almost worth separating.
Hebomoia	..	glaucippe, L.	....	Nep.-B.		
		austoralis, But.	....	S. C.	= ceylonica Fruh., C form.	glaucippe and australis seem to both occur in S. India.
		roepstorffi, W.M.	....	An.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
PIERIDÆ—contd.						
Pareronia.	...	avatar, M.	....	Sik.-B.		
		parav a t a r ,	DeN.	Ten.		
		valeria .. hippia, Fab.	I. B.	.....		Typical ceylanica (a w. s. f.) is confined to Ceylon; its. d. s. f. fraterna (=spiculifera) occurs in S. India and Ceylon, while in certain parts of S. India it seems to grade with hippia. Pingasa seems to be a w. s. f. confined to S. India. I believe that pingasa and ceylanica are races of the same species and possibly hippia may eventually turn out to be conspecific. More dated specimens from all districts are wanted, Naraka presents certain constant, though small, differences.
		(female v. livilla, Fruh.)				
		pingasa, M.	....	S.		
		naraka, M. ..	An.			
		ceylani c a ,	S. C.		= fraterna, spicu-	
		Fd.			lifera. M.	
LYCÆNIDÆ.						
GERVINEÆ.						
Gerydus	symothus.	....	Ten.		
		Cr.				
		boisduvalii,	....	Sik.-B.	= irroratus, Druce,	
		M.			Siam.	
		longeana.	Up B. (dry			
		DeN.	zone).			
		assamensis.	....	As.		
		Doh.				
		ancon, Doh.	....	Ten.		
		croton,	....	B.		
		Doh.				
		higgsii,	....	B.	= gopara, DeN.	
		Dist.				
Allotinus..	drumila M.	....	Sik.-As.		
		subviola-	....	S. B.		
		ceus, Fd.				
		horsfieldii,	....	As.-B.		
		M.				
		taras, Doh.	....	S. B.		
		panormis,	....	Karen. H.		
		El.				
		nivalis,	....	Ten.		
		Druce.				
		multistri-	....	Sik.-B.		
		gatus, DeM.				
Logania	marmo-	....	S. B.		
		rata, M.				
		watsoniana.	Up. B.			
		DeN.				
		massalia.	Up. As.			
		Doh.				
LYCÆNIDÆ.						
LYCÆNINÆ.						
Pithecopis ,		hylax. Fab.	....	Sik.-B.	.....	In the arrangement of the Lycæ- nina Bingham has more or less been followed: Swinhoe's arrangement is very different.
		fulgeus.	....	As.		
		Doh.				
Neopithe-		zalmora.	....	I. B. C.		
-cops.		But.				
Spalgis ..		epius, Wd.	....	I. B. C.		
		nubilus, M.	An.-N. I.			

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ,—contd.		LYCÆNINÆ—contd.				
Taraka ..	....	hamada, Druce,	....	Sik.-B.		
Megisba ..	....	malaya, Hors.	....	....
Una ..	....	usta, Dist.	....	Naga H.		
Cyaniris ..	(Notarthritis),	vardhana, M.	....	Kash-Kum.	.....	Dr. Chapman in P. Z. S., 1909, I. p. 419 gave a revision of the genus "Lycanopsis" (vice Cyaniris rejected) based on the male organs; lilacea was unfortunately omitted: with a few alterations Dr. Chapman's arrangement is here followed.
		musina ..	musinoides, Sw.	Khasi- Ten.	musina, Snel- Java.	The Javan musina is distinct enough, but without examining the male organs I do not see how musinoides is to be distinguished from jynteana. Binghami can be recognised by the even wide dull brown border, below it is very like jynteana.
		bingnami, Chp.	....	B.		
(Cyaniris),		nielaena, Doh.	....	S. Ten.		
		marginata, DeN.	....	Kum.-B.		
		akasa, Hors.	....	S. C.		
		albocæru- lea, M.	....	Simla-Up B.		
		transpecta, M.	....	Sik.-B. Ni		
		lilacea, Hamp.	....	S.		
		puspa, Hors.	....	I. B. C. An.	.....	Dr. Chapman states that placida and jynteana are races of limbata; I have seen the specimens he examined and each of the so called jynteana I would have identified as placida: Moore's type of jynteana from the Khasi Hills (I have not seen DeN's type) and of sikkima from Sikkim are forms of argiolus and I am sure that an examination of their male organs would confirm this.
			cyanescens, DeN.	Ni.		
		albidisca, M.	....	S.		
		dilecta, M.	....	Simla-Up. B.		
		lanka, M.	....	C.		
		limbata, M.	....	As. Beng- S. C.		
			placida, DeN.	Sik.-B.		
		argiolus ..	cœlestina, Koll.	Chit-Kum.	=puspargiolus, bo- thrinoides, albo- cœruleoides	Jynteana is a very variable form: I do not think that Dr. Chapman's varieties are worth retaining: Victoria is, I think, a d. s. l. form "greyed over": I have seen similarly "greyed over" specimens of puspa, dilecta and placida.
			jynteana, DeN.	Sik.-Up. B.	Chap. ? parri- shii, Rhé Philip- pe. sikkima. M.	Parrishii probably=Jynteana (or? musinoides or binghami): in a difficult group like this to describe a new species from a single specimen without even examining the genitalia is inadvisable.
			(v. victoria, Sw).	....		I have specimens of imbata from Assam.

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.,	Notes.
LYCÆNIDÆ—contd.		LYCÆNINÆ.—contd.				
Cyaniris (Cyaniris).		huegeli, M.	....	Kash-Kum.	.....	Dr. Chapman states that huegeli is conspecific with celestina: I have left them separate for the present: it is not a case of seasonal variation but may be dimorphism. Breeding experiments are necessary. Huegeli does not occur in Chitral though celestina is common. I place oreana and singalensis here: in size, etc., they are very like huegeli.
-contd.						
		oreas	.. oreana, Swin.	Khasi.	oreas=Leech, China.	
		singalensis.	....	C.		
		Fd.				
	(Bothrinia)	chennellii,	....	As-Up. B.		
		DeN.				
Lycæna	.. (Plebeius)	christophi.	.. samudra, M.	Chit.-Kash.	= bracteata=But.	L. bracteata is given by Scitz separately as a race of argyrognomon, Berg., the type specimen is an exact synonym of samudra. The Chitral form of samudra differs in having the discal spots on the forewing below very enlarged.
		loewii, Zell.	....	Chit.		
		chamanica,		Bal.		
		M.				
		cytis, Lang.	....	Chit.	.....	The Chitral form of cytis is typical; the form of iris is rather darker than the typical form from Alai,
		iris, Std.	....	Chit.		
	(Scutillanti- des).	baton	.. cashmirensis, M.	Bal.-Chit.- Kash.	= vicrama, M. hy- las Esp is a dif- ferent species.	
	(Latorina).	orbitulus..	jaloka, M.	Kash.		
		leela, DeN.		Lad.	= ellisi, DeN.	The Chitral form of orbitulus is very different to jaloka and leela, being more like the European form: the male above is a brilliant shining light blue green, the outer margin being rather broad, there are no white spots above, the spot at the end of the cell is black; the female is brown with a white encircled black spot at the end of the cell and some obscure white postdiscal spots: it is larger than jaloka. I propose to call it walli after Maj. F. Wall, I. M. S., who obtained a good series at 12,000 feet in July 1910.
		walli, Ev.		Chit.		
	(Albulina).	pheretes	.. lehana, M.	Chit.-Sik.	.....	L. pheretes lehana and asiatica occur together in Sikkim.
		asiatica, El.	....	Sik.		
	(Lycæna)...	metallica, Fd.	....	Chit.-Lad.	.....	As pointed out by Swinhoe, metallica and omphissa are separate: Chitral specimens of metallica are not so green as the typical form.
		omphissa.	....	Lad.		I have used Swinhoe's subgenera with addition of Tiora and Brima (vice Polyommatus): Tiora is for the simple eyed section with metallic spots on the hindwing below: a new subgenus is perhaps required for sebrus.
		M.				
		galathea,	....	Chit.-Kum.		
		Blanch.	....	Sik.		
		youngh u s-	....		
		bandi, El.				

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes
LYCÆNIDÆ—contd.		LYCÆNINÆ—contd.				
Lycæna ..	(Aricia) ..	astrarche, Berg.	....	Bal.-Chit.-Kum.	=medon, L.	
—contd.		eumedon. Esp.	....	Chit, Gilgit	=antiqua Std., jermyni, Sw.	In Chitral typical eumedon and antiqua fly together and intergrade.
	(Bryna) ..	stoliczana, Fd.	....	Chit.-Sik.	=ariana M. drasula, Sw. sutureja, and pseuderos, M.	I believe only one stoliczana like species flies in India, of which balucha is a race; Seitz gives eros sutureja and balucha; stoliczana and icarus are very variable but cannot, I think, be further separated into well defined races or varieties.
		balucha, M.		Bal.	usually as a race of eros Och.	
		icarnus, Rott.	....	Bal.-Chit.-Lad.	=persica, Bnt. : fugitiva, Bnt. : chitralensis, Sw. : drunela, Sw.	
	(Tiora) ..	sebrus ..	shandura, Ev.	Chit.	sebrus, Bdl., Central Asia and Europe.	L. shandura is, I think, a race of sebrus, Bdl.: it differs however in having obscure metallic spots near the anal angle of the hindwing below: shandura is smaller than sebrus, dull dark blue above, below the spots are very small and regular and arranged just as in sebrus.
		devanica, M.	....	Chi.-Lad.		L. devanica is a large species with the blue colouration on the forewing very reduced and a black female: it flies at 8000 feet in Chitral with sartoides. On the Shandur Pass (12000 feet) there flies a third form very similar to devanica differing in being much smaller (size of iris) and in having the blue colour above extended to the margin. I propose to call it <i>gracilis</i> : the cilia are chequered as in devanica.
	(Phengaris) sarta ..	gracilis, Ev.	Chit.	sarta	Alph, Turkestan.	
		atroguttata sartoides, Sw.	Chit.	.....	
		Doh.	....	Naga, Chin-H.		
Chilades ..	....	latus, Cr...	....	I. B. C.		
		trochilus, Frey.	....	N. I.-B.		I am not sure that I have got the distribution of trochilus and putli quite right.
		putli, Koll. ..	Centr. I. S. C.			
Zizera ..	....	maha, Koll.	....	N & Centr. I.-Up. B.	.....	The arrangement of Zizera is more or less in accordance with Butter's revision (P.Z.S. 1900): in separating ossa I follow Swinhoe who states that its genitalia differ from those of maha. I am not sure that I have given the distribution of opalina, otis and indica correctly.
		ossa, Sw.	..	S.		
		opalina, Pouj.		S. B.	=zera, Faw. : marginata, Pouj.	
		lysimon, Hub.	....	I. B. C. Ni.	? better as lysimon karsandra M.	
		gaika, Fab.	....	I. B. C. An.		
		otis, Fab.	....	N. I.-B. Au.		
		indica, Murray.		Centr. I.-S. C.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.,	Notes.
LYCÆNIDÆ—contd.		LYCÆNINÆ—contd.				
Iveres	argiades ..	dipora, M.	N. I.-Up. B.	=diporides, C h p. argiades, P a l l. Europe.	Dr. Chapman (T.E.S. 1903) states that argiades and parrhasius have different clasps and describes a third species, diporides, from Mandi (N.-W. Him). Swinhoe gives these 3 forms and also dipora as distinct species. Seitz only gives parrhasius as Indian.
			parrhasius, Fab.	S. C.		
		potanini, Alph.	....	S. B.		
		kala, DeN.	....	As.		
		moorei, Leech.	....	As.		There are a few specimens of E. moorei in the B.M. from the Khasi Hills (DeN. recorded it also, J.A.S.B. 1894): the Assam form differs from Chinese specimens in being smaller and darker, also the spots below show distinctly through above. Seitz puts moorei in Lycæna; in appearance it is more like a Cyaniris or Chiladas.
Falicaða	nyseus, Guér.	....	S. C.	.....
			khasiana, Sw.	As.-Up. B.	= khasia Druce.	Burmese specimens of nyseus differ a good deal from S. Indian specimens but Khasi specimens seem very much the same.
Catachry- sops-	strabo, Fab.	....	I. B. C. An. Ni.		In J.A.S.B. 1895 DeNicéville considered C. strabo and lithargyria to be separate species; Swinhoe keeps them separate.
		lithargyria, M.	....	As.-B. C. An.		
		pandava, Hors.	....	I. B. C.	.....
		onejus, Fab.	....	I. B. C.		
Azanus	ubaldus, Cr.	....	I. B. C.		
		uranus, But.	....	I.	? d.s.f. of ubaldus.	
		jesous ..	gamra, Led.	I. B. C.	jesous, Guér, Africa.	
Tarucus	theophrastus, Fab.	....	I. C.		
			venosus, M.	N.-W. Him.	? worth separating.	
		plinius, Fab.	....	I. B. C.		
Castalius	rosimon, Fab.	....	I. B. C. An. Ni.		
		ananda, DeN.	....	Sik.-B. S.		
		ethion, Db. and Hew.	....	As.-B. S. C.		
			airavati, Doh.	Ni.		
		roxus, God.	....	S. B. An.		
			roxana, DeN.	Up. B.		
			manluena, Fd.	Ni.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ—contd.		LYCÆNINÆ—contd.				
Castalius —contd.	decidia, Hew.	....	Sik.-B. Centr. I. S.		
		eina, Hew.	....	Sik.-B. Oriss. An.		
Niphand a.	cymbia, DeN.	....	Sik.-As.		
Orthomi- ella.	marcia, Few.	....	B. Sik.-B.		
Lycæn es- thes.	pontis, El.	....	Sik.-B. Beng. N. Kan. An.	.....	The representative of <i>L. emolus</i> in the Palni Hills is very distinct, and I propose to call it <i>topa</i> ; it is smaller than <i>emolus</i> , the border is broader on the forewing; below the bands are filled in with darker colouring as in <i>Nacaduba coelestis</i> , the markings are more regular, the discal band on the forewing is formed of almost separated spots, that in space 4 being transverse; the marginal lunules are prominent; the sub-anal ocellus is all black and there are 2 small black spots at the anal angle, the ciliated tails seem absent. I have one specimen and there is one specimen in the Bombay N. H. S. museum.
			topa, Ev.	.. Palni, H.		
Nacaduba,	lycænina, Fd.	....	Sik.-B. Beng. S. C.		
		viola, M.	....	Sik.-B. S. C. An.		
		kerriana, Dist.	....	S. B.		
		macropt- halma, Fd.	....	Sik.-B. S. C. An. Ni.	.....	I have only seen <i>macropthalma</i> from Sikkim, Up. Burma there seems to be a good deal of confusion between this species and <i>pavana</i> : the small andaman form of <i>pavana</i> is nearest the battered relics of Horsfield's types. The common S. Indian species of this type is nearer true <i>pavana</i> than to <i>macropthalma</i> . DeN and Bing. do not give <i>pavana</i> from South India or Ceylon.
		pavana, Hors.	....	Sik.-B. S. C. according to Swin. An. this is Felder's hermus.		
		bhutea, DeN.	....	Sik.-Up. B.		
			kodi, Ev.	.. Palni H.		
		ancyra, Fd.	....	As.-B. Ni.		
		dana, DeN.	....	Kum.-B. Beng. S.		
		hampsoni, DeN.	....	Muss. C. I. Nilgiris.		
		sivoka, Ev.	....	Sik. B. An.	There are specimens of this in the B. M. from Bhutan, Tenasserim and Malacca.	
		nora, Fd...	....	I. B. C. adima, Rhé Phil. I an ab.		I believe with various other writers that <i>nora</i> and <i>noreia</i> are separate species; <i>nora</i> the tailed form, is often yellow below.
		noreia, Fd.	....	I. B. C. =ardates, M.		
		coelestis, DeN.	....	Kum.-Up. B.-An.		
		atrata, Hors.	....	Sik.-B. S. C =kurava, promi- Ni. nens, M.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ—contd.		LYCÆNINÆ—contd.				
acaduba —contd.	plumbeo- micans, WM and DeN.	....	Sik.-S. C. An.	.....	There seems a good deal of confusion between atrata and plumbeomicans; DeN. gave the latter from S. Burma and the Andamans; Swin. and Bing. extended the range to Sikkim. In S. India 2 species certainly occur and one seems to be plumbeomicans or a race of it. N. atrata was described from Java and prominens from Ceylon is certainly a synonym; the types of kurava seems to have disappeared.
		nicobarica,...		Ni.		
ampides..	bochus, Cr.	....	I. B. C. An.	.....	Swin. gives conferenda, But., as a separate species; I am convinced that it is only the dry season form of celeno.
		nicobarica, WM. and DeN.		Ni.		
		coruscans.	....	C.		
		M. lacteata, DeN.	....	C.		
		subdita, M.	....	Ten.		
		pura, M.	..	As.-B.	Swin. as cleodius, Fd. L. cleodius is a Philippine insect; it is a different butterfly from pura but the forms may be conspecific.	
		celeno, Cr.	....	I. B. C.	=conferenda, But.	
		kinkurka, Fd.		Ni.		
		cœrulea, Sw.	....	As.-B.	=bochides, DeN.	
		elpis, God.	....	I. B. C.		
		kankena, Fd.		Ni.	=rogersi, Bing.	
		kondulan a. Fd.	...	Ni.		
Polyommatus.	boeticus, L.	....	I. B. C. An. Ni.		
LYCÆNIDÆ.		PORITINÆ.				
Poritia .. (Poritia).		hewitsoni. M.	....	Kum.-As.		
		tavoyana, Doh.		As.-B.	=geta, Faw.	
		sumatræ, Fd.	....	S. Ten.		
		pleurata, Hew.	....	S. B.		
		phraatica, Hew.	....	S. B.		
		erycinoides, Fd.	....	Up. B.		
(Simiskina).		phalia, Hew.	....	Ten.		
		pedida, Hew.	....	Ten.		
		phalena, Hew.	....	As.-Up. B.	=harterti, Doh.	
Zarona	jasoda, DeN.	....	S. B.	=zanella, DeN.	
Cyanitoides	libna, Hew.	....	Mergui.	=(Logania) andersoni, M.	

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ—contd.		CURETINÆ.				
Curetis	thetis, Drury.	....	S. C.	=? arcuata, M.	The forms of Curetis are puzzling. Of arcuata there is in the B. M. only one male from Malabar, the locality may be wrong; the specimen resembles a small gloriosa. The races of thetis seem well defined; nicobarica female is very distinct, on the forewing there is a small dark yellow patch, on the hindwing a diffused white subcostal patch.
		gloriosa, M.		As.-M.		
		saronis, M.		An.		
		nicobarica, Sw.		Ni.		
		bulis, Db. and Hew.	....	I. P.	.....	C. bulis has not developed into definite races like thetis; malayica with a yellow female seems separate; angulata and discalis are well defined varieties. C. felderi is not Indian.
		(v. angulata, M.)	....		=dentata, stigma- ta, M.; sperthis. Fd.	
		(v. discalis, M.)	....		
		malayica, Fd.		Rangoon- Ten.		
THECLINÆ.						
ephyrus..	khassia, DeN.	....	As.		
		ataxus, Db. and Hew.	....	Murree- Kum.		
		duma, Hew.	....	Sik-Naga Hill.		
		zoa, DeN.	....	Sik-Naga Hill.	.....	Maj. Tytler at Manipur has recently obtained several specimens of Z. zoa; DeNiceville in his "Butterflies of Sikkim" considered the only specimen then known to be an aberration of duma.
						Z. mandara should, I think, be dropped; The only known specimens are in the United States; it may be an aberration of icana or dohertyi.
						Swinhoe substitutes Ruralis for Zephyrus and calls the sub-family Ruralinæ.
		letha, Wat.	....	Chin.		
		birupa, M.	....	Simla-Kum.		
		syla, Koll.	....	Chit.-Sik.	=triloka Hannyang- ton.	
		ziha, Hew.	....	Simla- Muss.		
		pavo, DeN.	....	Bhut.		
		icana, M.	....	Simla-Kum.		
		dohertyi, DeN.	....	Simla-Kum.		
Chætoprocta	odata, Hew.	....	Chit.-Kum.		
Euaspa	millionia, Hew.	....	Murree- Kum.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCENIDÆ—contd.		THECLINÆ—contd.				
Teolycaena.	....	sinensis, Alph.	....	Bal.		
Thecla ..	....	sassanides, Koll.	....	Bal.-Chit. Muss. Chit.		
Callophrys.	....	rubi, L. ..	.. .		
Satsuma ..	....	leechii, DeN.	....	Khasi H.		
lerda ..	....	sena, Koll.	....	Chit.-Kum.		
		epicles, God.	....	Kum.-Up B.		
		kohmensis, Tytler.	....	Naga-H.		
		tamu, Koll.	....	Chit.-Kum.		
		viridipunc- tata, DeN.	....	Kum.-Sik.	.....	Some Chinese specimens of viri- dipunctata are very like kala.
		kala, Tytler.	....	Naga-H.		
		androcles, God.	....	Kash.-Kum.	.....	The Eastern form of androcles has the green colour of a conspicuously more brassy tint; I propose to call it <i>viridis</i> . I believe that moerei ought to be put as a race of androcles.
		viridis, Ev...	....	As.-Up. B.		
		moerei, Hew.	....	Sik.-Bhut.		
		brahma, M.	....	Kum.-Up.B.	=hybrida, Tyt., a cas ab.	
Chrysopha- nus.	....	phlaeas, L.	....	Bal.-Chit.- Kum.	=timeus, Cr., sty- gianus, But.	
		pavana, Koll.	....	Kash.-Kum.		
		solskyi ..	aditya, M. ..	Chit.-Lad.		
		kasyapa, M.	....	Chit.-Muss.		
		caspius ..	susanus, Sw.	Bal.	.....	C. sarthus and transiens, Sld., are races of caspius from Tur- kestan and the Pamirs.
		evansii, DeN.	....	Chit.		
		tseng, Ober.	....	Shan St.	=mandersi, El.	
Aphnæus .. (Cigaritis)..	acamas ..	hypargyr u s, But	Cutch, Bal.- Chit.	M....		In Palaearctic regions Aphnæus and Chrysophanus are closely allied.
(Aphnæus).	vulcan u s, Fab.	....	I			I think that all vulcanus like forms occurring in Ceylon should be regarded as fusca in Ceylon specimens the orange anal patch on the hind- wing below is not extended upwards along the dorsal mar- gin as in continental speci- mens.
		fusca, M. ..	C.	=minima, But., a cas ab and greeni Heron, a cas ab.		
		gabriel, Sw.	....	Up. B.	.....	There is a good series of gabriel in the B. M.; it is quite a dis- tinct form and represents vul- canus perhaps in Up. Burma.
		schistacea, M.	....	S.-C.		
		lilac in u s, M.	....	U.P.-Malda, Bombay.		
		abnormis, M.	....	S.-C.		
		syama, Hors.	....	Sik.-B. Oris.	=peguana, M.	
		lohita, Hors.	....	Kum.-B. S. C.	=concanus, M.	
		zoilus, M. ..	....	S.		

Genus.	Sub-genus.	Species.	Race.	Locality,	Synonyms, &c.	Notes
LYCÆNIDÆ—contd. THECLINÆ—contd.						
Aphnæus —contd.	(Aphnæus) —contd.	ictis, Hew.	....	I. C.	rukmini, DeN. an ab.	A. ictis is an extremely variable species and when more mate- rial becomes available I think separate races from the West- ern and Eastern Himalayas and South India might be es- tablished.
		maximus, El.	....	S. B.		
		nipalicus, M.	....	Muss. Nep.	=zaffra, DeN.	A. nipalicus is allied to liacinus and schistacea; I have seen the type of nipalicus and have no doubt that zaffra is a syno- nym.
		sani, DeN.	..	Sik.-B.	rukma, DeN. an ab.	
ARHOPALINÆ.						
Thaduka ..	....	multicau- data, M.	....	Ten. S.	.....	Mr. Bethune Baker (T.Z.S. 1903 gave a revision of this sub- family and I have followed him; I have included the genera Zinaspa and Mota as they seem best placed here.
Mahathala.	(Mahathala). Apporosa).	ameria, Hew. atkinsoni, Hew.	.... ....	Beng. As.- B. Ten.		
Iraota ..	....	timoleon, stoll.	....	I. B.	=mæcenæ, Fab.	I am not sure that the South Indian form of timoleon ought not to be called nicevillei.
			nicevillei, But.	C.		
		rochana, Hors.	....	Mergui.		
Amblypo- dia.	....	anita, Hew.	..	I. B. C. An.	=naradoides, M. arracana, Cr. S. erichsonii, W. M. and DeN.	I do not think it is worth while to separate anita into races.
			(female v. da- rana, M.)	S. C.		
		narada, Hors.	....	An. Mergui.	=taoana, ander- soni, M.	
Surendra..	....	quer cet o- rum, M.	....	I. B. An.	=biplagiata, But. tatimargo, M.	
			discalis, M.	C.		
		amisena, Hew.	....	Ten.		
		florimel, Doh.	....	Ten.	=stimula, DeN.	
Zinaspa ..	....	todara, M.	....	S.		
			distorta, DeN.	Sik.-B.		} These two are very close.
Mota ..	....	massyla, Hew.	....	Ehnt.-B.		
Arhopala ..	....	meander ..	constanceæ, DeN.	An.	.....	Moore has divided the Arhopala group into several genera but their adoption as sub-genera even seems useless as the spe- cies run into one another in every direction; even the construction of a key presents great difficulty as whatever character is taken, viz., tails colour, spots on the underside it seems hopeless to define na- tural groups.

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
NYCENIDÆ.—contd.		ARHOPALINÆ—contd.				
rhopala		centaurus,	....	E. Kum.-B.	=pirithous, M.	
—contd.		Feb.				
		pirama, M.	S. C.	) These seem worth separat- ing.		
		coruscans,	An.			
		WM. & DeN.				
	amantes,	....	I. G.An.			
	Hew.					
		amatrix,	Up. As.-Up-			
		DeN.	B.			
	camdeo, M.	....	Sik.-B.			
	opalina, M.	....	As.	type seems unique.		
	bazaloides,	....	As.-B. S.	=bazalus, De N.		
	Hew.			nec., Hew.		
	albopuncta-	....	B.			
	ta, Hew.					
	alibæus. ..	mirabella,	Mergu.			
		Doh.				
	mindanen-	....	Mergui.			
	sis, B.B.					
	aida, DeN.	....	S.B.			
	vihara, Fd.	....	Up. Ten.			
	adorea,	....	Sik.-B.			
	DeN.					
	dama, Sw.	....	Ten.			
	apha, DeN.	....	Ten.			
	adatha,	....	B.			
	Hew.					
	silhetensis,	....	Sik.-B.	=arama, DeN.		
	Hew.					
	nicevillei,	....	Sik..B.			
	B.B.					
	anthelus.	....	Ten.			
	Db. & Hew.					
	subfasciata,	....	Ten.			
	M.					
	anarte,	....	Cach.-B.			
	Hew.					
	agaba, Hew.	....	Naga H.-B.			
	zambra, Sw.	....	Ten.			
	selta, Hew.	....	Ten.			
	arca, Hew.	....	Ten.			
	rafflesii,	....	Ten.	=pseudomuta, DeN.		
	DeN.			nec Hew. and		
				amphimuta Dist.		
				nec Fd.		
	atosia ..	aricia, Std...	Ten.			
	epimuta, M.	....	Ten.			
	moolaiana,	....	Ten.	=pastorella, Doh.		
	M.					
	antimuta,	....	Ten.	=davisonii, DeN		
	Fd.					
	hypomuta,	....	Ten.			
	Hew.					
	metamuta,	....	Ten.			
	Hew.					
	oberthuri,	....	Ten.			
	Std.					
	alesia, Fd.	....	An. B.	=wimberleyi, DeN.		
	eumolphus,	....	Sik-As.	.....	
	Cr.					
		hellenore,	As.-B. •	=viridissima, Sw.?		
		Doh.				
		farquhari,	S. B.	=maxwelli, Dist.		
		Dist.				

Bethune Baker unites all the races, of eumolphus; they are, however, very distinct.

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ—contd.		ARHOPALINÆ—contd.				
Arhopala	basiviridis,	....	B.		
—contd.		DeN.				
		abseus,	....	Sik.-B.	.....	The Burmese form of abseus may prove to be worth separating when more specimens are available; it is near irregularis, Snell.
		Hew.		N. Kan. C.		
		diardi, Hew.	....	As.-B.		
		fulgida,	....	Sik.-Up. B.		
		Hew.				
		anniella,	....	Ten.		
		Hew.				
		artegal,	....	S. B.		
		Doh.				
		apidanus,	....	B.		
		Cr.				
		ahamus, Doh.		Up As.		
		adriana,	....	Sik.-Up B.		
		DeN.				
		asoka, DeN.	....	Sik.-B.		
		chinensis,	....	Sik.-Up. B.	=moelleri, DeN. la-	
		Fd.			zula, M.	
		areste,	....	Nep.-As.		
		Hew.				
		bazalus,	....	Sik.-B.	=teesta, DeN. tur-	
		Hew.			bata, But.	
		singla, DeN.	....	Sik.-Up. B.		
		antura, Sw.	....	Ten.	very near vihara	
					or adorea.	
		agrata,	....	S. B.		
		DeN.				
		ædias,	....	B.		
		Hew.				
		agnis, Fd.	....	B.		
		yendava,	....	B.	?=agnis, Fd.	
		Gr. S.				
		khamti,	....	Up. As.		
		Doh.				
		cenea, Hew.	....	Sik.-As.		
		rama, Koll.	....	Kash.-B.		
		atrax, Hew.	....	B.		
		hewitsoni,	....	I. B.	=atrax A n et nec	
		BB.			Hew.	
		alemon,	....	B.		
		DeN.				
		canaraica,	....	S.		
		M.				
		alea, Hew.	....	I.?	locality doubtful.	
		dodonæa,	....	Chit.-Kum.		
		M.				
		comica,	....	Bhamo.	.....	Bethune Baker places comica as a casual aberration of dodonæa, but as dodonæa has never been found east of Kumaon and comica was described from Burma this cannot possibly be the case.
		DeN.				
		paramuta,	....	Nap.-B.		
		DeN.				
		zeta, M. ..	....	An.		
		roona, M...	....	An.-Ten.	?=zeta, M.	
		agelastus,	....	Ten.	?=moolaiana M.	
		Hew.				
		Sounguva,	....	B.		
		Gr. S.				

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ.— <i>contd.</i>		ARHOPALINÆ— <i>contd.</i>				
Arhopala.		perissa,	....	Ten.		
— <i>contd.</i>		Doh.				
		asopia,	....	Ten.		
		Hew.				
		aeeta, DeN.	....	Ten.	B.B. considers this to be an ab of asopia.	
		perimuta,	....	Sik.-B.		
		M.				
		belphebe,	....	As.-B.		
		Doh.				
		duessa,	....	Ten.		
		Doh.				
		ammonides,	....	Ten.		
		Doh.				
		birmana, M.	....	S. B.	=arisba, DeN.	
		aberrans,	....	B.		
		DeN.				
		paraganesa,	....	Kum.-Up.B.		
		DeN.				
		zephyretta,	Up.-As.			
		Doh.				
		ariel, Doh,	....	Up.-As.		
		ganesa, M.	....	Chit.-Kum.	.....	Watson described a race of ganesa from the Chin Hills in J.B.N. H. S. x. but gave it no name; I propose to call it <i>watsoni</i> . I think ganesa, dodona and rama ought to be placed together.
		watsoni, Ev.	Up. B.			
		arvina,	....	Ten.	=abce, DeN.	
		Hew.				
		adala, DeN.	....	Ten.	=adulans, DeN.	
		fulla, Hew.	....	An.		
		andamani-	....	An. Ten.	=subfasciata, M.	
		ca, W. M.				
		& DeN-				
DEUDORIGINÆ.						
Zesius	chrysol-	....	Malda.	I have a curious	Bingham includes what I have called the Deudoriginæ with the Theclinae. I am not sure that it would not be preferable to restrict Deudoriginæ for the first portion and place every thing from Thamala onwards in a new sub-family which might be called Myrinae.
		mal-		Centr.	male ab, which is	
		lus, Hüb.		I., S. C.	blue above in-	
					stead of copper.	
Deudorix.	epijarbas,	....	I. B. C. An.		
		M.		Ni.		
		diara, Sw.	....	Jaintia H.		
		gaetulia,	....	As.-B.		
		DeN.				
		hypargyria,	....	Karen, H.	Elwes placed this	
		El.			in Rapala but	
					makes no men-	
					tion of any se-	
					condary sexual	
					characters.	
Hysudra	selira, M.	....	Chit.-Kum.		
		hades,	....	Ten.		
		DeN.				
Virachola.	isocrates.	....	I. C.		
		Fab.				
		perse, Hew.	....	I. C.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCENIDÆ—contd.		DEUDORIGINÆ.—contd.				
Virachola.	smilis, Hew.	....	An.		
—contd.						
Rapala	deliochus, Hew.	....	B.		
		tara, DeN.	....	kum.-As.	=francesia, Sw.	
		sphinx, Fab.	....	Syl.-B.	=nicevillei, Sw. a darker form.	
		scintilla, DeN.	....	Sik.		
		lankana, M.	....	S. C.		
		schistacea, M.	....	I. C.		
		abnormis, El.	....	Karen H.		
		buxaria, DeN.	....	Sik.-Up. B.		
		rosacea, DeN.	....	Sik.-As.		
		nissa, Koll.	....	Kash.-B.	=rectivitta, M. maculata, Seitz. subpurpurea, Leech.	
		ranta, Sw.	....	Jaintia, H.		
		varuna, Hors.	....	I. B. C. An.	=orseis, Hew. gri-sea and lazulina, M.	Rogersi is much larger than varuna; some specimens from Burma are equally large.
			rogersi, Sw.	Ni.		
		subguttata, El.	....	Karen, H.		
		refulgens, DeN.	....	Khasi H.-Nep.		
		petosiris, Hew.	....	Sik.-B. oriss.		
		suffusa, M.	....	Syl.-B.	=testa, Sw. barthema, Dist.	
		melampus, Cr.	....	I. C.		
		jarbas, Fab.	....	Sik.-B.	Seitz. as a race of melampus.	
		xenophon, Fab.	....	Beng. As.-B.	=dienece, Hew. damona, Sw.	
			intermedia, Std.	An. Ni.		
Sinthus	nasaka, Hors.	....	Kangra.-As. B.		
			amba, Kirby.			
		chandrana, M.	....	Kum.-Up. B.		
		virgo, El...	....	Sik.-B.		
Listeria	dudgeoni, DeN.	....	Muss.-Bhut.	.....	Listeria is rather a peculiar genus; I am not sure that it would not be better placed in the Theclinae.
Dacalana	vidura .. burmana, M.	....	S. B.		
Ar rh eno-trix.	penicilligera, DeN.	....	As.-B.		
Camena .. (Camena) ..		cotys, Hew.	....	Nep.-B.		
		ctesia, Hew.	....	Kum.-As.		
		argentea, Aurivill.	....	Sik.-B.-S.	=cippus Auct. nec Fab.	
		lectas, Hew.	....	Dalhousie-B.		
		deva, M. .	....	I. B. C.	=lila, M. (?race from N. I).	

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, etc.	Notes.
LYCÆNIDÆ—contd.		DEUDORIGINÆ—contd.				
<i>Camena</i> (Camena)		<i>carmentalis</i> , Den.	....	Sik.-B.	.....	I think <i>ister</i> should be dropped, it seems to be a female aberration of <i>cleobis</i> . Swinhoe states that it is the female of what DeN. described as <i>carmentalis</i> ; he may be right but the two insects are very dissimilar. I have a female ab of <i>cleobis</i> from the Nilgiris very similar to the type of <i>ister</i> in the B.M.
—contd.	—contd.					
		<i>icetoides</i> , El.	....	Karen, H..		
	(Creon) ..	<i>cleobis</i> , God.	....	I.	= <i>ister</i> , Hew, ? a female ab.	
	(Maneca) ..	<i>bhotea</i> ., M.	....	Sik.		
	(Creusa) ..	<i>culta</i> , DeN.	....	As.		
Ops	.. (Ops)	<i>ogyges</i> , DeN.	....	Ten.		
		<i>oeta</i> , DeN.	..	Ten.		
		<i>melastigma</i> , DeN.	....	Sik. B.-S.		
	(Britomartis).	<i>cleoboides</i> , El.	..	Sik.-B.		
	(Bullis) ..	<i>buto</i> , DeN.	....	Ten.		
		<i>valentia</i> , Sw.	....	Khasi H.		
Tajuria	.. (Tajuria) ..	<i>longinus</i> , Fab.	....	I. B. C.	= <i>cippus</i> , Fab.	
		<i>jehana</i> , M.	....	I. C.		
		<i>nela</i> , Sw. ..	.....	Jaintia H.		
		<i>diaeus</i> , Hew.	..	Muss-As.		
	<i>thya</i> , DeN.		....	Sik.-As.		
		<i>albiplaga</i> , DeN.	....	Sik.		
	<i>tyro</i> , DeN. ..		....	B.		
	(Remelana), <i>yajna</i> , Doh.		....	Muss-Bhut.	= <i>istroidea</i> , DeN.	
		<i>megistia</i> , Hew.	....	As.		
		<i>teza</i> , Sw.	....	Jaintia H.		
	<i>thria</i> , DeN.		....	Ten.		
		<i>donatana</i> , DeN.	....	Ten.		
	<i>mantra</i> , Fd.		....	Ten.		
	<i>jangala</i> ..	<i>ravata</i> , M. ..	..	Sik.-B.	<i>jangala</i> , Hors., Java.	
		<i>andamanica</i> , W.M. & DeN.	An.			
(Cophanta).	<i>illurgis</i> , Hew.		....	Muss-B.	.....	There are several specimens of <i>luculenta</i> , Leech (described from Omei Shan) in the B.M. from the Khasi Hills; it is very similar to <i>illurgoides</i> and may be a local race of the latter species; it differs in having a large extent of pale cerulean blue above.
		<i>illurgoides</i> , DeN.	....	Kum.-Up. B.		
		<i>luculenta</i> , Leech.	....	Khasi		
		<i>maculatus</i> , Hew.	....	Sik.-B.S.		
	<i>jalindra</i> ..	<i>indra</i> , M. ..	..	Sik.-As. Beng. S.		
		<i>tarpina</i> , Hew	An.			

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ—contd.		DEUDORIGINÆ,—contd.				
Hypolyce æna.	erylus, Gcd.	....	Sik.-B. An.	=andamana, M.	
		thecloides, Fd.	....	Ten. Ni.		
Chliaria	othona, Hew.	....	Muss.-B. S.		
		kina, Hew.	....	Muss.-B.	=cachara, M., an exact synonyma.	
		nilgirica, M.	....	S. C.		
		merguia, Doh.	....	Ten.	=watsoni, Sw.	
Thamala	miniata, M.	....	B.		
Sithon	nedymond, Cr.	....	Ten.		
Araotes	lapithis, M.	....	Sik.-B.		
Biduanda..	thesmia, Hew.	....	Ten.	=fabricia, M.	A number of different Biduandas are recorded from Tenasserim; there are only specimens of melisa and thesmia in the B. M.
		scudderii ..	....	Ten.		
		melisa, Hew.	....	Bhut.-B.		
		cyara, Hew.	..	Sik.		
		nicevillei, Doh.	....	Ten.		
Marmessus.	lysias, Fab.	....	B.	=boisduvalii, M.; M. lysias is recorded from the moorei, Dist. is Nicobars but DeNiceville from the Malay Peninsula. considered it to have been an error.	
Suasa	lisides, Hew.	....	As.-B.		
Neocheritra.		amrita, Fd.	....	S. B.		
		fabronia, Hew.	....	Sik.; Up.B.		
Manto ..		martina, Hew.	....	Ten.		
Eoxylides.		tharis, Hüb.	....	B.		
Cheritra ..		freja, Fab.	....	E. Kum.—B.	.....	The Ceylon race of freja differs from jaffra only in size.
		jaffra, But. ..	....	S. C.	=? pseudojaffra M. Ceylon.	
Ticherra ..		acte, M. ..	....	E. Kulu-B.		
Cheritrella.		truncipennis, DeN.	....	Sik.-B.		
Zeltus ..		etolus, Fab.	....	Sik.-B. S.		
Bindahara.		phocides, Fab.	....	Beng. As.-B. An.	=ines Sw. (Andamans).	
		areca, Fd. ..	....	Ni.	=kamorta, Fd.	
		sugriva .. moorei, Fruh.	....	S. C.	sugriva, Hors, Java.	
Loxura ..		atymnus, Cr.	....	N. I. B. Ni.		
		surya, M. ..	....	S.		
		arcuata, M...	....	C.		
		prabha, M. ..	....	An.		
Yasoda ..		tripunctata, Hew.	....	Sik.-B.		
Ritra ..		aurea, Druce.	....	Ten.		
Neomyrina.		hiemalis, God. & Salv.	....	Ten.		
Drina ..		donina, Hew.	....	B.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
LYCÆNIDÆ—contd.		DEUDORIGINÆ—contd.				
harana ..		mandari- nus, Hew.	....	Sik.-B. An.		
chera	eryx, L. ..	cephais, DeN.	Cachar. Sik.-B.		
		skinn e r i, W.M. and DeN.	....	Cachar- Khasi.		
atapæcil- ma.	e l e g a n s, Druce.	....	Muss.-B.S. C.		
		subochra- cea, El.	....	Karen, H.		
		delicatum, DeN.	....	Sik.		
athinda..	amor, Fab..	....	As.-Oriss, S. C.		
oraga	onyx, M. ..	....	Dalhousie- B. Oriss. S. C.		
		cingalensis, M.	....	Sik.-B	=sikkima, M.	H. moulmeina only differs from onyx in being ochreous below instead of dull brown.
		moulmeina. M.	....		
		rana, DeN.	....	An.	=andamana, M.	
		viola, M. ..	....	Kangra- Sik. S.		
		albimacul a, W. M. and DeN.	....	An.		
LIPHYRINÆ.						
aphyra	brassolis, Wd.	....	Sik. B.		
HESPERIIDÆ.		HESPERIINÆ.				
rt h o p æ- tus.	phanaeus, Hew.	....	B.	.....	The Hesperiidæ have been ar- ranged in accordance with Elwes and Edwards revision (T.Z.S. 1897); the Ismenine have been separated as done by Mabille in the Macrolepidop- tera. I have given a full synonymy.
		lalita, Doh.	....	B.		
		lidderdal i, El.	....	Bhut.		
Capila	jayadeva, M.	....	Sik.-B.		
		zennara, M.	....	Sik.-B.	The S. Burma form differs slightly.	
Calliana	pieridoides, M.	....	Bhut-As.		
Crossiura..	pennicilla- tum, DeN.	....	As.		
Hantana	infernus, Fd.	....	C.		
Achalarus.	bifasciatus, liliana, Atk..	....	As.B.	bifasciatus, Leech, China.	
		casyapa, M...	Kash-Kum.			
Charmion..	fic u l n e a, Hew.	....	B.	=signata Druce, leucographa, Pl.	
Celænor- rhinus.	pero, DeN.	..	Kangra-As.		
		pulomaya, M.	....	Kangra-As.	=lucifera, Leech.	
		aspersa, Leech.	....	As.-B.	=clitus, DeN.	
		ambareesa, M.	....	Beng.-As.		
		flavocincta, DeN.	....	Bhut.		
		sumitra, M.	....	Sik.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HESPERIIDÆ - contd.		HESPERIINÆ - contd.				
Celaenorrhinus.	pyrrha, DeN.	....	Kum.-B.	=patula, plagifera, DeN.: pluscula, Leech.	Pyrrha seems a good species differing from sumitra in having prominent discal spots on the hindwing above; sumitra is a good deal larger and only bears a series of marginal spots on the hindwing.
		maculicornis, El. & Ed.	....	As.		
		leucoceera, Koll.	....	I. B. An.	=putra, M., leucocircæ, El.	
		munda, M.	....	Kulu-Sik.		
		spilothyrus, Fd.	....	Sik.-S. C.	=ruficornis, Mab.? area, Plötz.	
		fusca, Hamp.	....	S.	.....	C. fusca can easily be separated from spilothyrus by the chequered cilia.
		chamunda, M.	....	Sik.-Up. B.		
		nigricans, DeN.	....	Kulu.-B.		
		asmaræ, But.	....	As.-B.	=cacus, consertus, DeN.; goto, Mab. palajava, Std.	
		dhanada, M.	....	Muss. B.		
		andamanica, W. M. and DeN.	....	An. Ni.		
		zea, Sw. ..	....	Khasi H.		
		affinis, El. and Ed.	....	As.-B.		
		aureivittata, M.	....	As.-B.		
		badia, M...	....	Sik.-As.		
Cnaiolade	indrani, M.	....	Muss.-B	.....	C. tissa is the plain form of indrani; some specimens of indrani from Burma are very pale.
		tissa, M.	..	Beng. Cetr. I.-S. C.	=lankæ, Pl.	Sikkim specimens of dan are very light, but the species is extremely variable.
		dan, Fab...	....	Kash.-B. S.	=fatih, Koll; cacus, Lat.; dea, Leech; dichroa, Pl.	
		laxmi, DeN.	....	Sik.-B.		
		agni, DeN.	....	Sik.-B.		
		agnoides, El. & Ed.	....	As.		
		buchanani, DeN.	....	Up. B.		
		hamiltoni, DeN.	....	As.		
Tapena	thwaitesi, M.	....	Oriss.-B. C.		
		minuscule, El. & Ed.	....	B.		
		hampsoni, El. & Ed.	....	S.		
Ctenoptilum.	vasava, M.	....	Muss.-B.		
		multiguttata, DeN.	....	B.		
Odontoptilum.	angulæa, Fd.	....	I.-B.	=sura, M.	
		pygeia, Hew.	....	S.B.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
IESPERIIDÆ—contd.		HESPERIIDÆ—contd.				
Caprona	ransonnet- tii, Fd.	....	I.-C.	=taylorii. DeN.	C. saraya is almost certainly a variety of taylorii the d.s. f. of ransonnettii. I have specimens agreeing with saraya from the Dun. C. alida and ransonnettii seem to run into one another. There is a specimen in the B. M. marked 'kuki, Bing., Loo-shai Hills, to be described in part III Butterflies, Fauna of India'; until more specimens are obtained it should be regarded as an ab. of alida.
		alida, DeN...		Up.-B.	kuki, Bing., an ab.	
		syriethus, Fd.	....	I. B.	=agama, M., elwe- sii, Wat.	I have caught specimens of syriethus in the Palni Hills smaller than elwesii, Wat.
Tagiades	helferi, Fd.	....	Ni.	=noctis.	
		ravi, M.		Beng. Sik- B. An.	.....	The form khasiana of ravi, with more or less white on the hindwing below is merely seasonal.
		alica, M. ..	....	Cash-As- B. An.	=athos, Pl.; mee- tana, M.	The alica-gana group is rather confusing. T. alica was described from the Andamans and is inseparable from athos, Pl. from Sylhet; meetana, M. is from Tenasserim and is rather paler. T. distans (= ? obscurus Mab, Java) was described from Calcutta and differs somewhat from alica, the translucent spots on the forewing are prominent and the upper black discal spot on the hindwing below is well separated from the lower spots and not in line with them. T. gana was described from Java and only differs from alica in having a large snow white area on the hindwing above. Indian specimens are smaller; there are in the B. M. specimens of gana from Ceylon, which ought, I suppose, to be referred to distans. I have placed alica distans and gana as separate species following Elwes, but I think that they will eventually prove to be races of a single variable species.
		distans, M.	....	Beng. S. C.	= ? obscurus, Mob.	
		gana, M. ..	....	Sik.-B.	=menanto, Pl. ?	
		lavata, But.	....	Ten		
		atticus, Fab.	....	I. B. C. an.	=menaka, M.; calli- gana, But.; litigi- osa, Mosch.	
		nana, El. & Ed.	....	As.-B.		
		dealbata, Dist.	....	As.-B.		
		trichoneu- ra, Fd.	....	Syl.-B.	} doubtfully separate.	
		pralaya, M.	....	Sik.-B.		
		pinwilli, But.	....	As.-B.		
		tabrica, Hew.	....	Sik.	? race or ab of pin- willi.	

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HESPERIIDÆ—contd.		HESPERIIDÆ—contd.				
Satarupa	gopala, M..	....	Sik.-B.		
		bhagava, M.	....	Sik.-B.		
		andamanica, W M & DeN.		Oriss. S. An.		
		narada, M.	....	Sik. B.	=? diversa, Leech.	S. diversa is recorded from Assam; it is very near narada and may be the Chinese race; all the Assam specimens I have seen of this variable form are narada.
		phisara, M.	....	Sik.-B.		
		sambara, M.	....	Sik.-As.	=corinna, Pl.	
		dohertyi, Wat.		Muss. Kum.		
		affinis, Druce.		B.	=cognata, Druce and ? niphetes, Weymer.	
Odina	decoratus, Hew.	....	Syl.-B.		
		ortygia, DeN.	....	Ten.		
Darpa	hanria, M.	....	Muss.-As.		
Sarangesa.	purendra, M.	....	Kulu-Kum.		
		sati, DeN.	....	Centr. I-S. Cutch.C.P.?		
		dasahara, M.	....	Kangra.-B.		
		albicilia, M.	....	Centr. S. C.	=sezendis, Pl.	
Carcharodus.	althæa, Hüb.	....	Bal.-Chit.	=marrubii, H.S.; boeticus, Ramb.	
		alcea, Esp.	....	Bal.-Chit.-Kash.	=malvarum, God.; dravira, M.; swinhoei, Wat.	
Hesperia	galba, Fab.	....	I. B. S.	=superna, M.; evanidus, But.	H. evanidus does not seem separate from galba; zebra seems quite distinct.
		zebra, But.	....	Punjab.	=hellas, DeN.; nanus, Trimen.	
		orbifer, Hub.	....	Chit.	.....	Chitral specimens of orbifer are near lugens, Std., Thian Shan, a variety not given in Elwes and Edwards; the species is extremely variable and runs into sao Berg.
		phlomidis, geron, Wat ..		Bal.	phlomidis, H. S., Asia Minor.	
		poggei, Led.	....	Bal.		
		alpina, Ersch.	....	Chit.	.....	Typical alpina occurs in Chitral; Kashmir specimens have all the markings very reduced; the two forms were both described in 1874.
		cashmirensis, M.		Kash.-Kum.	=durwazica, Cr.	
Thanaos	marloyi, Bdl.	Chit.	Chitral specimens of marloyi are much darker than those in the B. M. from other localities.
Gomalia	albofasciata, M.	Kangra-S. C. Bal. Sindj	=littoralis, Swin.	

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Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HESPERIIDÆ - contd.		PAMPHILINÆ.				
Pamphila	avanti, DeN.	....	Kum.Sik.		
		dieckman- ni, Gräser.	....	As.-Up. B.	=demea, Ober.; gemmatus, Leech.	
Baracus	vittatus, Fd.	....	C.		
		subditus, M.	....	S.		
			Septentrio- num, WM. & DeN.	Sik.-B.	.....	The so called septentrionum recorded from the Nilgiris is really the d. s. i. of subditus.
		hampsoni, El. & Ed.	....	S.		
Sanctus	puligo, Mab.	....	Cach.-B.S.	=ulunda, forensis, kethra, Pl.; subfa- sciata, M.	
Astictop- erus.	olivascens, M.	....	Kum.-B. Beng. S.	=chinensis, Leech; melania, Pl.	A, jama, Fd., Sumatra, is a very obscure form; Felder compared it with Aeromachus indistincta and the female type is said to=koruthaialos butleri female.
		henrici, Btl.	....	As.-B.	=kada, Sw.? nub- ilus, Mab.	
Korutha- ialos.	xanites, But.	....	B.		
		rubecola, Plötz.	....	Naga B. ..	=hector, Wat.; gem- mifer, But.; pala- wites, Std.	
		butleri, WM. & DeN.	....	Sik.-B.		
Suada	swerga, DeN.	....	Sik.-B.		
Suastus	gremius, Fab.	....	I. B. C.	=raika, Pl.; sub- grisea and divo- dasa, N.; robsonii, DeN., an ab.	Robsonii is merely a starved aberration of gremius; I have a specimen from Jabalpur and two dwarfed specimens of gremius (also from Jabalpur) rather near robsonii.
		aditus, M.	....	Sik.-B. Beng.-An.	=sala, El. and Ed.; nec, Hew.	S. aditus is usually put as a synonym of sala, Hew.; sala is, however, a very different form and put here under Pedestes.
		bipunctus, Sw.	....	S.		
		minuta, M.	....	C.	=sinhalus, Pl.;	
Taractroce- ra.	maevius, Fab.	....	I. B.	=fiacculus, Fab.; sa- gara, M.	The Ceylon form of maevius has not the veins on the hindwing below conspicuously pale as in continental specimens.
		danna, M..	....	Simla.-As.		
		ceramas, Hew.	....	S.	=silhetica, Pl.	
		nicevillei, Wat.	Bombay ..		=coras, Auct; nac, Cr.	
		oberthuri, El. & Ed.	Trichino- poly-Ani- malai H.			
		atropunc- tata, Wa.	....	Up. B.		
		archias, Fd.	....	Ten.	.....	T. archias is rather like A. maro above, and below like T. dara.
		ziclea, Pl..	....	B.	=mæsooides, Std.; luzonensis, Mab.	T. ziclea is exactly like small specimens of T. dara that have no black spotting below; the only difference is the antennæ which in ziclea have a spatulate club, yellow coloured below; in dara the club is all black and has a terminal crook.
Ampittia	maro, Fab.	....	I. B. C.	dioscoroides, Fab.; camerta, M.; lynx, Mösch; palemo- nides, Pl.	
		maroides, DeN.	....	Ten.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HESPERIIDÆ—contd.		PAMPHILINÆ—contd.				
Jambrix	salsala, M.	....	Sik.-B, S.C.	=luteipalpis, Pl.	
		stellifer, But.	....	B.		
Ochus	subvitta- tus, M.	....	Kum.-Up.B.	=subradiatus, M.	
Aeromachus,	stigmata, M.	....	Kangra-As.	....	There are practically no speci- mens of Aeromachus in the B. M. collection.
		discreta, Pl.	....	As.-B.		
		jhora, DeN.	....	Sik.-B.		
		dubius, El. & Ed.	....	S.		
		indistincta, M.	....	B.-S.	=pygmæa, M.	
		obsoleta, M.	....	As.		
		kali, DeN..	....	Sik.-B.		
Sebastony- ma,	dolopia, Hew.	....	Sik.-B.		
Pedestes	masurien- sis, M.	....	Muss.-Sik.		
		pandita, DeN.	....	Sik.-As.		
		sala, Hew.	....	Cachar.- B. S.	=submaculata, Std.	I was always under the impres- sion that sala was the same species as aditus, but on exa- mining Hewitson's type found it to be what has usual- ly been called submaculata sala was described in Suastus Elwes and Edwards placed submaculata in Platingia and DeNicville put the latter in Pedestes in his list of the N. Kanara butterflies. I defer to DeNicville's opinion but in general appearance sala is ver- like Suastus gremius: it can be easily distinguished from gremius by the spotted apex of the forewing below.
Isma	protoclea, Hs.	....	S. B.	=iapis, DeN.	
Hyarotis	adrastus, Cr.	....	I. B. C.	=praba, M.; phoeni- cis, Hew.	
Arnetta	vindhiana, M.	....	Centr. I. S.	=nilgiriana, modes- ta, M.	
		atkinsoni, M.	....	Sik.-B.	=subtestaceus, kha- sianus, M.	
		binghami, Sw.	....	S. B.		
Itys	microstic- tum, WM. & DeN.	....	Cachar.		
Zograph e- tus.	satwa, DeN.	....	Kum.-B.		
		flavalum, DeN.	....	Sik.		
		ogygia, Hew.	....	Sik.-B. S. An.	=flavipeunis, DeN, d. s. f.	
		maculicor- nis, El. & Ed.	....	B.	? very near if not= P. sala, Hew.	
Scobura	phiditia, Hew.	....	B.	=martini, El. and Ed.	S. phiditia is usually placed in Suastus, but as it is generally believed to be the male of Scobura martini, I think it is better placed here.
		cephala, Hew.	....	Sik.-B.	=isota, Sw.	
		cephaloi- des, DeN.	....	As.-B.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms; &c.	Notes.
ESPERIIDÆ— <i>contd.</i>		PAMPHILINÆ— <i>contd.</i>				
<i>cerbas</i>	<i>anthea</i> , Hew.	....	Ten.	= <i>tagiadoides</i> , Mab.	
<i>trionota</i>	<i>thrax</i> , L. ..	....	Duu.-B.	= <i>lara</i> , Sw.	<i>E. acroleuca</i> is given from As- sam to Burma as well as from the Andamans, but continen- tal specimens differ somewhat and are best regarded as small varieties of <i>thrax</i> .
		<i>acrolenca</i> , WM. & DeN.	....	An.	= <i>hiraca</i> , M.	
		<i>batara</i> , M.	....	B.	= <i>attina</i> , M; <i>latreil-</i> <i>lei</i> , Fd; <i>cruda</i> , HS.; <i>anitta</i> , Pl.	<i>E. batara</i> was formerly placed in a separate genus, <i>Unkana</i> .
<i>rudicitia</i>	<i>pholus</i> , DeN.	....	Bhut.-As.		
<i>angara</i>	<i>thyrsis</i> , Fab.	....	Sik.-B.	= <i>pandia</i> , M.	
<i>aduka</i>	<i>lebadea</i> , Hew.	....	Beng.-S. C. Sik.-B. C. An.	= <i>glandulosa</i> , Dist.; <i>subfasciata</i> , M.; <i>andamanica</i> , WM. & DeN.	
<i>latapa</i>	<i>aria</i> , M. ..	....	I. B. C. An.		
		<i>purpurascens</i> , El. & Ed.	....	As.-B.		
		<i>druna</i> , M...	..	Sik.-B. An.	= <i>pulla</i> , Pl.	
		<i>sasivarna</i> , M.	....	Sik.-B.		
		<i>shalgrama</i> , DeN.	....	Sik.-B.		
<i>erana</i>	<i>diocles</i> , M.	....	Kum.-B.		
<i>stimula</i>	<i>swinhoei</i> , El. & Ed.	....	As.-B.	.....	<i>S. swinhoei</i> was first put in the genus <i>Watsonia</i> but the latter name was found to be preoc- cupied.
<i>birdana</i>	<i>hyela</i> ..	<i>rudolphii</i> , El. & DeN.	Sik.-B.	<i>hyela</i> , Hew.; Malay Penin.	
		<i>distanti</i> , Std.	....	B.	= <i>pavona</i> , DeN.	
<i>Platingia</i> a.	<i>callineura</i> , Fd.	....	B.		
		<i>margherita</i> , DeN.	....	As.-B.	? a race of <i>callinen-</i> <i>ra</i> .	
		<i>corissa</i> , Hew.	....	Ten.	= <i>drancus</i> , Pl.; <i>lato-</i> <i>nia</i> , Std.; <i>indrassa-</i> <i>na</i> , El. & DeN.	
		<i>noemi</i> , DeN.	....	Sik.-B.		
		<i>naga</i> , DeN.	....	As.-B.	=? <i>tessellata</i> , Hew.	
		<i>idyalis</i> , DeN.	....	S.B.	Placed by DeN. in <i>Isma</i> .	
<i>Lorongus</i>	<i>calathus</i> , Hew.	..	S.B.	= <i>maculatus</i> , Dist.; <i>parthenope</i> , Weym.; <i>aliena</i> , Std.; <i>zala-</i> <i>tes</i> , <i>sarus</i> , Mab.; <i>traviata</i> , Pl.	
		<i>zeus</i> , DeN.	..	As.-B.		
		<i>avesta</i> , Hew.	....	B.	<i>tamiata</i> , Std.	
		<i>sarala</i> , DeN.	....	As.		
<i>Creteus</i>	<i>cyrina</i> , Hew.	....	Sik.-B.	= <i>parca</i> , DeN.; <i>me-</i> <i>leagrina</i> , Std.	
<i>Zea</i>	<i>taproba-</i> <i>nus</i> , Pl.	....	? C.	= <i>mytheoides</i> DeN.	
<i>Hidari</i> ..		<i>irava</i> , M. ..	....	B.	= <i>hypcæpa</i> , Hew.	
		<i>bhawani</i> , DeN.	..	B.		

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HESPERIIDÆ—contd.		PAMPHILINÆ—contd.				
Pithauria.	murdava M.	....	Sik.-B.	I have a spotless ab. of this.	
		straminei- pennis, WM. & DeN.	....	Sik.-B.		
		aitchisonii, WM. & DeN.	....	Cachar.-B.	=glauca, Std.	
Oerane	neæra, DeN.	....	S.-B.		
Notocrypta.	feisthame- lii, Bdl.	....	I.B.C.	=curvifascia, Fd. N. alysos, albifascia, restricta, M.; vo- lux, Mab.; clava- ta, Std.; rectifas- cia, Leech; vari- ans, Maas.; chi- maera, Pl.	restricta is often regarded as a different species from feis- thamelii but I think they should be united.
		paralysos, WM. & DeN.	....	An.	? a race of feistha- meli.	
		basiflava, DeN.	....	S.		
		monteithii, WM. & DeN.	....	cachar.-B.	=singularis, Mab.	
Udaspes	folus, Cr.	....	I.B.C.		
Actinor	radians, M.	....	Chit.-Dun.		
Cupitha	purrea, M.	....	Sik.-B.	=tympanifera, M;	
Augiades	subhyalina, Br. & Gr.	....	Oriss. S. An.	lycorias, Mab.	
		siva, M. ..	....	As.-B.		
		brahma, M.	....	Muss.-Kum.	? a race of siva.	
Telicota .. (Telicota) ..		augias, L.	....	I. B. An.	.....	I have here followed Elwes as regards the synonymy of dara but with considerable doubt; De Niceville and Watson both placed mæsoides and pseudh mæsa as separate species oc- curring with dara. Kollars type specimen came presum- ably from the W. Himalayas, and is probably exactly the same as mæsa M., Kunawur, the small pale form, pale yel- low below spotted with black. T. pseudomæsa is from Ceylon and is very like dara differing only in being a dark yellow orange below; it may be a race of dara but is not a distinct species. T. mæsoides was de- scribed from a Malacca speci- men in poor condition with no antennæ it is like dara but dar- ker, below it is dark yellowish red and the marks are not de- fined with black; there are similar specimens from South Burma in the B. M. I have not seen the types of the other "species" described. In the B. M. and in my own collection two forms stand out, a small form agreeing with the types mentioned and a large form whose name I do not know, but at present I do not see my way to do anything than con- sider all the Indian specimens as belonging to dara.
		bambusæ, M.	....	I. B. C.	=pythias, Mab.	
		palmarum, M.	....	Beng.-B. An.-Ni.	=chrysozona, Pl.	
(Padraona).		concinna, El. & Ed.	....	S.		
		gola, M. ..	....	Sik.-B. Oriss. S. C.	=goloides, M.; akar. Mab.; locus, alfu- rus, fabriolata, Pl.	
		rectifasci- ata, El. & Ed.	....	An. Sik.-B.		
		dara, Koll.	....	I. B. C. An.	=mæsa, M.; mæ- soides, pseudomæsa, But.; haterus, Semp.; su- nias, Fd.; flava, nitida, taxilus, trachala, zebra, Mab.; nala, za- tilla, Pl.	

Genus.	Sub-genus	Species.	Race.	Locality.	Synonyms, &c.	Notes.
IESPERIIDÆ—contd.		PAMPHILINÆ—contd.				
alpe	..	zema, Hew.	....	Sik.-B.	=ormenes, Pl.	
		cerata, Hew.	....	Sik.-B.		
		astigmata, Sw.	....	S.		
		hyrie, DeN.	....	Bhut-As.		
		kumara, DeN.	....	Sik.-Bhut.		
		knyvetti, El. & Ed.	....	Sik.		
		moorei, Wat.	....	Muss.-B. Beng.-S. An.	=teliga, Sw.	H. moorei is probably a race of ceylonica.
		ceylonica, M.	....	Oriss.-S. C.		
		homolea, Hew.	....	Sik.-B.	=marta, a n c m a, Sw.; pal a w e a, Serup.	
		sikkima, M.	....	Sik.-As.	=wantona & pera- ra, Sw.	H. sikkima with its uncheq- uered cilia is different to homolea: the Assam form (wantona) seems rather smal- ler.
		hyrtacus, DeN.	....	S.	.....	There are some specimens be- longing to Halpe in the B. M. from Ceylon and South Burma which belong to undescribed species but being only single specimens I do not think that they ought to be described until more are obtained.
		egena, Fd.	....	C.	=brunnea, Pl.	
		fusca, El ..	....	B.		
		sitala DeN.	....	S.		
		evershedii, Ev.	....	Palni H.		
		gupta, DeN.	....	Garhwal. As.		
		debilis, El. & Ed.	....	As.		
		aina, DeN.	....	Garhwal. As.		
		separata, M.	....	Kum. As.		
		albipectus, DeN.	....	Shan St.		
		masoni, M.	....	B.		
		honorei, DeN.	....	S.		
		decorata, M.	....	C.		
		ornata, Fd.	....	Cachar.		
uryza	..	meiktila, DeN.	....	B.		
ton	..	watsoni, DeN.	....	B.		
		semamora, M.	....	Sik.-B.	=barea, Hew.	
Parnara	.. (Baoris)	oceia, Hew.	....	Sik.-B. Beng Centr. I. C. Au.	=farri, penicillata, scopulifera, M.; sikki m a, S w.; unicolor, M.	
	(Milena)	plebeia, DeN.	....	Muss.-B. Oriss. S.	=mormo, Mab.	Plebeia, the only Parnara with a tuft of hair on the underside of the forewing deserves to be placed in a separate subgenus for which I propose the name Milena, Swinhoe's Caltoris does not seem worth retain- ing.

Genus.	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
HESPERIIDÆ—contd. PAMPHILINÆ—contd.						
Parnara.	(Chapria) ..	brunnea, Snell.	....	B.	=cœere, DeN.; so- dalis, Mab.	
-contd.		prominens, M.	....	Kangra.-B. Centr. I. S.	=midea, Walker; sinensis, Mab.; si- millis, Leech.	
		mathias, Fab.	....	I. B. C. An.	=thrax-Led; julia- nus Lat; larika, Pag; agna, sub- ochracea, chaya, M., balarama, ella, Pl.	
	(Parnara)	philippina, HS.	....	S. C.	=seriata, M.	P. philippina and kumara a very close to one another their genitalia were found to be different by Elwes and E wards.
		kumara, M.	....	Sik. B. Beng.-S.C.	=saruna, Pl.	
		canaraica, M.	....	S.	.....	P. canaraica seems to be th only member of this group with spots on the hindwin below; the type female in th B.M. really belongs to conjun ta I think.
		aurocliliata, El. & Ed.	....	Sik.		
		pagana, DeN.	....	Sik. B. Beng.	.....	The group pagana—cahira, & flying together, are difficult recognise; pagana has a sp in ♂ on the forewing; cahira on the forewing below has suffused black discal patch moolata is very like auster the former is deep warm brow below and the latter da chestnut.
		moolata, M.	....	As.-B.	=dravida, Mab. fe- male onchisa, Sw.	
		austeni, M.	....	Sik.-B.S.C. An.	=male onchisa, Sw.	
		cahira, M.	....	B.-An.		
		toona, M...	...	Kum.-B. S.	seorteia, contigua (?), Mab.; Kolan- tus, Pl.; pellu- cida, Mur.?	The Assam form of toona h whiter spots, rather like pell cida, the Chinese race.
		eltola, Hew.	....	Kangra.-B.		
		discreta, El. & Ed.	....	Sik.-B.	.....	P. contigua, Mab. was put as synonym of toona by Elw but the specimens arrang over this name in the B.M. & the Javan form of conjuncta
		guttatus, Br. & Gr.	....	Chit.-As.	=sifa, wambo, nan- doa, Pl., mangala, M.; fortunei, H.S.	
		bada, M. ..	....	I. B. C.	philotas, DeN. an ab.=haga, Pl. intermedia, H. S.	
		colaca, M..	....	I. B. C. An. Ni.	=cingala, M.; ure- jus, Pl.	
		bevani, M.	....	I. B.	=? flexilis, Sw.; thyone, Leech.	
		assamensis, WM. & DeN.	....	Muss.-As.	=abie, Pl.	
		conjuncta, HS.	....	I. B. C. An.	javana, Mab.; na- rooa, M.; alica, Pl.	
		uma, DeN.	....	B.	I have not seen this.	
		tulsi, DeN.	....	Sik.-Up.B.	=jolando, Pl.	

Genus	Sub-genus.	Species.	Race.	Locality.	Synonyms, &c.	Notes.
ESPERIIDÆ—contd.		PAMPHILINÆ—contd.				
Eogenes	alcides ..	lesliei, El.	Chit.	.....	In the B.M. there are several specimens, caught by me in Chitral, placed as Arnetta lesliei, El.; they are, however, very close to Eogenes alcides, differing in being darker, rarely having any cell spot in la on the forewing and in often having a discal spot on the hindwing below.
Eogenes	nostrodamus, Fab.	....	Bil.-Chit.-Dun. Panj.	=pumilio Hoff.; lefebrii, Kumb. pygmaeus, Hüb.: karsana, M.	
Gynnis	comma ..	dimila, M.	Chit.-Muss.	.....	Ladak specimens of dimila are very pale.
ISMENINÆ.						
Ismena	ataphus, Wat.	....	Kangra-B. C.	=consobrina, Pl.; ?ædipodea, M.	I. ædipodea from Java has the body and bases of the wings above sprinkled with metallic blue green scales.
		tuckeri, El. & Ed.	....	Ten.		
		mahintaha, M.	....	Cachar-B.		
		jaina, M.	.....	Muss.-B.		
		fergusonii, DeN.	....	S.		
		etelka, Hew.	....	B.		
		harisa, M.	....	Sik.-B.		
		anadi, DeN.	....	Muss.-As.		
		vasutana, M.	....	Kum.-As.		
		amara, M.	..	Sik.-Up, B.		
		gomata, M.	....	Sik.-S.	lorquinii, Mab.	
Rhopalocampa	benjaminii, Guer.	....	Kangra-B. S. C.	.....	Mackinnon in Mussoorie found that R. benjaminii has 2 forms of larva and Elwes (P.Z. S. 1891) pointed out that there seemed to be 2 forms of the imago, one with the green colour confined to the base, and the other green all over; this difference appears to be merely sexual and no further evidence seems forthcoming as to whether there are one or two species under this name.
		crawfurdi, Dist.	....	Ten.	=electra, Std.	
Badamia	exclamationis, Fab.	....	I. B. C. An. Ni.	=ladon, Cr., thymbron, Fd.	
Bibasis	sena, M.	....	I. B. C.		
Hasora	chuza, Hew.	....	As.-B.		
		coulteri, WM & DeN.	....	Cachar.		
		chabrona, Pl.	....	Sik.-B. S.		
		butleri, Aurivill.	....	I. B. C.	chromus, nec, Cr.	Auct.
		malayana, Fd.	....	An.-Ni.		
		chromus, Cr.	....	B. S. C.	alexis, M.	
		simplicissima, M. ab.	....	B.	=philetas, Pl.	
		anura, DeN.	....	Sik.-As.		
		badra, M.	....	Sik.-B.S.C.	quadripunctata, Mab.	

Postscript.

During a recent visit to Calcutta, I had an opportunity of examining the DeNicéville's collection and would like to make the following notes:—

Neptis melba.—There is a single specimen of this species in DeNicéville's collection labelled by him "*Neptis nyctea*, female type." I have examined the genitalia of my two specimens and find that they are both males. I believe DeNicéville's specimen is also a *melba*. The genitalia of *melba* differ from those of *narayana*, and *manasa* (= *nyctea*). In this connection it may be remarked that Oberthür, in "Etudes," 1906 (October), states that he has eleven specimens of *nyctea* and three of *manasa* from Sikkim: he considers that *nyctea* is a white marked race of *thisbe*, Leech (China) and that *manasa* is distinct species, the Chinese form of which he describes as *narcissina*.

Melitea trivia mixta.—DeNicéville has labelled the specimens of this race, that I sent him, as "*mercea*, DeNicéville," but I do not think that he ever published a description of *mercea*.

Lycæna deranica gracilis.—Similarly DeNicéville has labelled this "*lysias*," but I have seen no description.

The range of *Dilipa morgiana* is given as 'Kulu.—Up. B', it should be "Murree—Up. B". Also the range of *Dodona egeon* should be "Kash—B" instead of "Kash.—As."

Errata in Part I.

P. 561, near top, "camaralzaman, But. and "crameri" to be shifted up one line: "crameri" should be opposite "bremeri."

P. 563, line 9, for "Philareta" read "Philarcta."

P. 564, line 6 from end, for "bolancica" read "bolanica."

P. 566, line 5, "drypetis, Hew.," to be shifted down one line, so as to be in the same line as "... S. Oriss."

P. 570, line 13 from end, for "diadernoides" read diademoides."

P. 571, line 18, for "Croweay" read "Crowley."

P. 574, lines 7 and 8 from end, omit "eleanor, Fruh. S.B." and "pardalis, M. Mergui."

P. 577, line 4 from end, "columella. Cr." to be shifted down one line so as to be in the same line as "Dun—Up. B."

P. 578, line 7, "harita, M." to be shifted down one line so as to be in the same line as "E. Beng—B."

P. 573, line 10, "anjana. M." to be shifted to the left into the "species" column.

P. 578, line 9 from end, omit "ananta, M.... Chamba—B."

A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Part XVIII with Plate XVIII, Diagram and Map.

(Continued from page 475 of this Volume.)

The genus *Helicops* is one of many into which aglyphous colubrines, *i.e.*, colubrines without grooved or tubular teeth either in the front or back of the maxilla, are divided. It contains eleven species, which inhabit South Asia, Tropical Africa, and North and South America, but only one of these, *viz.*, *schistosus* occurs within Indian limits. The type is the Brazilian *H. carinicauda*.

HELICOPS SCHISTOSUS (Daudin).

THE OLIVACEOUS KEELBACK.

Our first introduction to this snake is through Russell who figured, and remarked upon it in 1801.*

Nomenclature (a) Scientific.—The generic name for which Wagler is responsible, dates back to 1830, and is from the Greek “elis,” rolling, and “ops,” eye, and seems to me specially suitable to our Indian representative, for I do not think I have ever observed another snake move its eyeballs so actively. The specific title given by Daudin in 1803 from the Latin meaning “slaty”, was probably suggested by the dorsal colour of Russell’s plate, or a spirit specimen. It is to my mind not appropriate, for in life the snake is olivaceous.

English.—The olivaceous Keelback seems to me a suitable name.

Vernacular.—Russell says it is known to the natives (on the Coromandel coast?) as “Chittee” which I am told is Telugu for

* Ind. Serp., Vol. II, Plate IV.

little, and "Nalla wahlagillee pam." In Mysore it is known by the Canarese name "Barmnya."

General characters.—The head is chiefly remarkable for its short, and rather pointed muzzle. The shields are glossy. The nostril is slit-like and placed rather high, distinctly approaching the type seen in the true water snakes of the Family *Homalopsinae*. It occupies about half the depth of the nasal shield, which is divided below it by a suture running to the 1st supralabial. The eye is lateral in its setting, rather small, the pupil round, and the iris speckled throughout with gold. The commissure of the mouth viewed in profile is seen to take a sudden bend upwards behind the eye. The tongue is plum-coloured. The neck is not very evident. The body is rather stout for the length of the snake, and the scales on the back are sharply ridged as in other Keelbacks. The tail is long, its relative length being nearly one-third the total length in males, but nearer one-fourth in females.

Dimensions.—My largest specimen is a ♀ measuring 2 feet 10 $\frac{1}{4}$ inches. Females attain a greater length than males, and I have had 7 measuring over 2 feet, but never a ♂ reaching this length. The average length of my 7 largest females is 2 feet 4 $\frac{3}{4}$ inches and that for my 7 largest males only 1 foot 10 inches.

Identification.—In colouring and general appearance it may be very easily confused with the water snake *Hypsirhina enhydris*, but bears a still more striking resemblance to *Rhabdops bicolor*. It is rather remarkable too that all these three snakes possess but a single internasal shield, a rare feature in lepidosis. If the lepidosis is studied its identification from all Indian snakes is easy. Three characters must coexist, and these are (1) a single internasal, (2) 19 costal rows in midbody, and 17 at a point two headlengths before the vent, and (3) 8 or 9 supralabials. The combination of the 1st and 2nd of these is only seen in two other Indian snakes, viz., *Cantorina violacea* and *Hypsirhina plumbea* which have respectively but 4 and 5 supralabials.

Colour.—Though Boulenger says it is dorsally olive-brown, all the many specimens I have seen in life have been olive-green. This hue is uniform on the upper parts of the head, body and tail in adults, and abruptly ceases in the middle of the penultimate

row. Boulenger * says there is usually a more or less distinct dark lateral streak, and some specimens have two series of small black spots along the back, but I have never noted these. Günther† says that the young have a blackish streak from the orbit, continued along the fore part of the body. The lower half of the penultimate row of scales, the ultimate and the under parts of the snake are uniform yellow, sometimes of a very bright hue. Sometimes there is a pinkish or lilac suffusion on the penultimate and ultimate rows. The head is uniform olivaceous above, merging to yellow on the lips, and usually has no streaks from the orbit, nor on the labials.

A very distinct variety occurs in South India which bears a narrow reddish line down the back on the confines of the 5th and 6th rows above the ventrals where the scales are 19, and the 4th and 5th where 17. This line disappears at the vent and I have noted is more vivid in males than females. I have never seen this in specimens from the Ganges Basin (Fyzabad).

Disposition.—Though Cantor‡ remarks that the species is very fierce, and Ferguson§ quotes Ingleby's words to the same effect, I have invariably found it very much the reverse, in fact I know of no Indian snake with a more inoffensive nature and nicer manners. I am not courageous where snakes are concerned, and object strongly to being bitten even by species that I know to be harmless, so I am always chary of handling them, but this species like the buff-striped Keelback (*Tropidonotus stolatus*) is so remarkably gentle that I pick it up fearlessly and have never been struck at, or bitten. When alarmed the snake will erect itself and flatten the neck like all other Keelbacks, and it may have been this behaviour that led the writers named above to suppose it fierce. Even the two I had conjoined in Bangalore permitted my handling them and making close investigations, without resenting my interference further than to try and elude my grasp. This placid nature is by no means associated with a lack of spirit, for the little reptile is as vivacious, active in movement and alert as any snake I know.

* Cat. 1893 Vol. 1, p. 274.

† Rept. Brit. Ind. 1864, p. 273.

‡ P. Z. S. 1839, p. 54.

§ Bomb. N. H. Jourl., Vol. X, p. 73.

Haunts.—The olivaceous Keelback exhibits a strong taste for an aquatic environment, and the position and character of its nostrils conforming to the type seen in the true fresh water snakes (*Homalopsis*) in itself proclaims the snake a water snake by habit. In Fyzabad I got no specimen during 19 months' residence, but when the river overflowed its banks and flooded the country for miles in August 1906, I had 8 specimens brought to me in 14 days, all from the inundated area. It by no means haunts rivers to the exclusion of jheels and similar collections of water, nor does it show a greater liking for flowing water, for in Bangalore where it was very common it was found haunting the small collections of water in the Lal Bagh, and other similar pools, elsewhere. The snakemen there denied that it was a watersnake, and said they never found it actually in the water, but at the edge of the pools where the dank soil favoured a luxuriant growth. They also frequently encountered it in the foliage, and lying along the stems of the bamboo brush near the water. In the rains I think it leaves the vicinity of pools, and wanders further afield, there being abundant moisture in the grass and weeds that spring up everywhere. I have met with it in the grass at some distance from water during the monsoon, and remember capturing one which crossed the pitch at Berhampur while a cricket match was in progress on the parade ground. Ferguson remarks that one he had in captivity in Trivandrum was never seen to enter the chatty of water provided for it and Mr. Ingleby mentions that a caged specimen he had invariably buried itself in the sand at the bottom of its cage with nothing but the extremity of its head and its eyes sticking out.

Habits.—*Schistosus* evinces a markedly diurnal habit being frequently encountered in daylight in the haunts it favours. It is probable that with such pronounced aquatic tastes, it is forced to retire for many months in the year. All the specimens I can recall were about during the rainy season of the year.

I have already alluded to the attitude it adopts when alarmed, a posture very typical of the Keelbacks of many genera including *Tropidonotus*, *Pseudoxenodon* and *Macropisthodon*. The neck in this species is very markedly flattened cobra-wise, and in addition

the snake flattens the part of the body not erected against the ground. I think this is noticeable to a more marked degree in the ♀. By no means every specimen one meets displays this attitude of alarm, for while some erect themselves as soon as disturbed, others require a good deal of provocation before they are worked up to the necessary degree of excitement. Usually when disturbed it slips away to the nearest cover, moving actively and speedily, and when captured is a very restless little creature striving time after time to reach the nearest available cover.

It is evidently an adept climber, to successfully negotiate the smooth stems of bamboo that arise at first perpendicularly from the ground. The Bangalore snakemen told me that they frequently found it as high as 8 and 10 feet from the ground, and it was in such a situation that the conjoined pair brought to me were reported to have been found.

Food.—Specimens I had in captivity fed on frogs, and Mr. Ingleby found the frogs that he offered were taken. Günther* includes fishes in its dietary. I cannot recall ever having got a specimen that had recently fed in a state of liberty.

The sexes.—As far as I can judge from my notes the sexes in Fyzabad and Bangalore are evenly balanced. Females as already stated attain considerably greater length than males, but males have relatively much longer tails, and therefore more numerous subcaudal shields. The males of the S. Indian variety appear to have a brighter red dorsal line and females appear to be able to flatten themselves more noticeably. The ♂ clasper is beset with numerous small falciform processes from the base to the tip.

Breeding.—Our knowledge of this is somewhat fragmentary, and leaves a good deal yet to be elucidated. The mating season appears to be during the rains from the single dated observation available, which came under my own notice. None of the 4 adult females I had in Fyzabad were gravid which points to the deposition of eggs being already accomplished before August, unless mating had up till then not been in progress. The latter possi

* Loc. cit.

bility is suggested by the pair found "in copula" in Bangalore, and brought to me on the 27th of August. These were observed united reclining on a bamboo stem 8 or 10 feet above the ground. On the evening of the 26th an attempt was made to capture them, but not pressed as the snakemen feared they would not earn their reward of Rs. 5 if they separated. They were successfully captured next morning and brought to me still united, and I had them under observation for some time. As far as I know they did not disengage for at least $25\frac{1}{2}$ hours. During this time I repeatedly examined them, and found the left clasper of the male engaged with the right orifice of the female. The ventral apposition of the two was so limited that nobody seeing them together would have suspected that they were coupled. They each lay in sinuous courses without their bodies or their tails being enwreathed and there was nothing demonstrative in their attachment as far as I could see at any time. Unfortunately the union was unfruitful, due, I believe, to my moving north to the United Provinces immediately after. The cold weather so far depressed the natural vigour of a *Macropisthodon plumbicolor* I also took from Bangalore with me, that a frog it swallowed remained undigested for some weeks and was subsequently disgorged and when the snake died 5 months and 6 days subsequently to its capture it was found to be gravid with the impregnated follicles but little enlarged, and much in the same state as the impregnated follicles of the *schistosus* at death. The period of gestation is not known.

Eggs.—The species is known to be oviparous from a cluster of eggs which Tennent* refers to which was found near a river in Ceylon, and from which 20 young snakes subsequently emerged. Unfortunately he does not give the date of their birthday. I had a gravid specimen sent me from Ceylon containing 10 eggs nearly one inch long but the date of capture was not recorded. My impregnated ♀ referred to above had 18 follicles enlarged. From these events it appears that *schistosus* is moderately productive.

Young.—The smallest specimens I have had both from Ceylon, measured $6\frac{5}{8}$ and $6\frac{7}{8}$ inches, and from their appearance I believe

* Nat. Hist. of Ceylon, p. 308.

were hatchlings. Here again no dates were given as to date of capture.

Distribution.—It is probably a commoner snake than available records which are rather meagre would make it appear. Before I went to the United Provinces it was not known to occur any where near there, but was evidently not uncommon. I got several specimens when stationed in Orissa (Berhampore). It is one of the commonest snakes about Bangalore, and is evidently common in Ceylon as I had 3 specimens in a small collection sent me from Henaratgoda.

It appears to be chiefly, if not entirely, a snake of the plains but is plentiful at 3,000 feet in Mysore, and has been recorded from the Anamallays and the Wynaad without any definite altitude being specified.

I have examined the three specimens collected by Anderson* in Yunnan which he referred to as a variety, *viz.*, *Yunnanensis*, but as all these specimens have the internasal shield divided, and a single internasal shield is one of the generic characters, and constant in all the other species it seems to me that these should be referred to a species apart from *schistosus* and unless the generic characters are modified should not even rank as a *Helicops*. Besides this feature in lepidosis, there is another, *viz.*, that the nasal shields in Anderson's specimens touch the 1st and 2nd supralabials, whereas in Indian specimens it almost always touches the 1st only.

The Malay Peninsula which has been included within its area of distribution on Cantor's authority I discredit, having already shown good cause to doubt many of Cantor's records.† No less than six Indian species have been recorded by this authority alone, from the Malay Peninsula, and as he received snakes from India the inference is that Indian specimens got mixed with his own Malay collection.

The accompanying map shows the area of distribution based on present records, but it seems likely to be extended as our knowledge progresses.

* Ann. Zool. Res. Yunnan 1879, p. 822.

† Bomb. N. H. Jourl., Vol. XVIII, p. 720.

Lepidosia.—*Rostral*.—Touches 5 shields, the nasal sutures largest. *Internasal*.—Single. *Præfrontals*.—Two, the suture between them subequal to the præfronto-frontal; in contact with internasal, nasal, loreal, præocular and supraoculars. *Frontal*.—Touches 6 shields, the supraocular sutures longest. *Supraoculars*.—Length and breadth rather less than frontal. *Nasal*.—Semi-divided, touching the 1st only of the supralabial series usually, the 2nd also sometimes. *Loreal*.—Single, about as long as high. *Præoculars*.—One. *Postoculars*.—Three. *Temporals*.—Two, elongate, the lower touching the 6th, 7th and 8th supralabials. *Supralabials*.—8, with the 3rd and 4th touching the eye, or 9 with 4th and 5th touching the eye. *Infralabials*.—7, the 5th, 6th and 7th normally touching the posterior sublinguals, 7th largest and touching 3 scales behind. *Sublinguals*.—Two pairs, the posterior rather the larger. *Costals*.—Two headlengths behind head 19, midbody 19, two headlengths before vent 17. Where the rows reduce from 19 to 17 the 4th row above the ventrals is absorbed into the one above or below. (This step usually well behind midbody sometimes occurs at midbody or even slightly before this); keels distinct except in the last two rows in midbody where they are absent; apical pits wanting. *Ventrals*.—139 to 149 in Bangalore specimens, 145 to 157 in Fyzabad (Boulenger 129 to 151). *Anal*.—Divided. *Subcaudals*.—Divided, 63 to 82 (Boulenger 55 to 85).

Anomalies.—I have twice seen the internasal partially divided posteriorly in Indian specimens. I have twice seen 3 præfrontals in a transverse series, the median rather the smallest. Once there were but 2 postoculars on one side. Once the last ventral was divided and once the 35th, 36th and 37th ventrals were divided. In one example there were only 7 supralabials, the 3rd and 4th touching the eye.

*Dentition**.—*Maxillary*.—19 to 21, gradually but progressively increasing in size posteriorly with no gap. *Palatine*.—11, subequal, and about the same size as the median maxillary. *Pterygoid*.—17 to 18, subequal, and about the same size as palatine. *Mandi-*

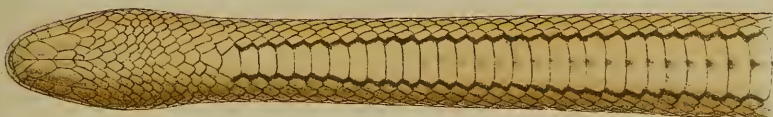
* From 2 Fyzabad skulls.



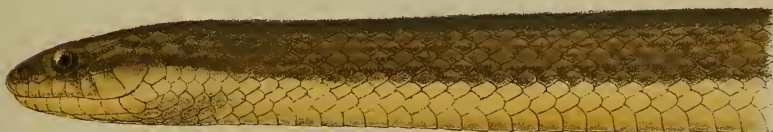
1.



1a.



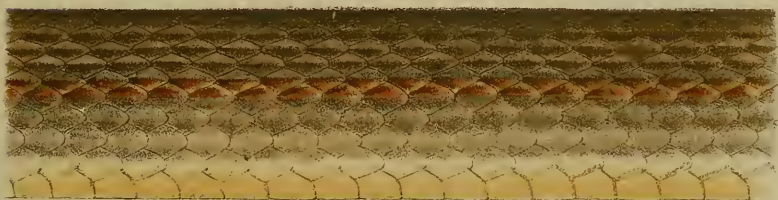
1b



2.



2a



2b

P. Gerhardt del.

J. Green, Chromo.

THE COMMON INDIAN SNAKES. (Wall).

1. *Hypsirhina enhydris*, *poisonous*, *nat. size*.

2. *Helicops schistosus*, *harmless*, *nat. size*.

bular—20 to 22, subequal, the first and last perhaps rather shortest.

Our plate leaves nothing to be desired, unless it is the dorsal colour which is usually of a greener tinge.

HYPSIRHINA ENHYDRIS (Schneider).

SCHNEIDER'S WATER SNAKE.

This snake being furnished with grooved teeth in the back of the maxilla comes into the opisthoglyphous "series" of colubrines. The series includes three subfamilies, *viz.*, *Homalopsinae*, *Dipsadomorphiinae* and *Elachistodontinae*.

The homalopsids are true fresh water snakes and classified in ten genera, seven of which are represented in India. One of these, *viz.*, *Hypsirhina*, includes fifteen species, one of which *enhydris* forms the subject of this paper. The type of the genus is *H. plumbea* which inhabits the Malayo-Chinese area and has been found in Burma.

History.—Our first introduction to *H. enhydris* is through Russell*, who under the name "Mutta pam" figured and remarked upon a specimen in 1796 which had been captured in an Eel trap in the Lake of Ankapilly (North of the Godavery, near Vizagapatam). Three years later Schneider alluded to it in his History of Amphibians, under the name *Hydrus enhydris*.

Nomenclature—Scientific.—The generic name from the Greek "hypsi," high, and "rhis," the nose, was introduced by Wagler in 1830 on account of the high position of the nostrils on the snout. The specific name also from the Greek "En," in, and "hydor," water, was given in 1799 by Schneider in allusion to its aquatic mode of life.

English.—Schneider's Water Snake suggests itself, reserving Russell's name to designate the other common water snake first alluded to by him and to which Schneider also stands as godfather. I refer to *Cerberus rhynchops*.

Vernacular.—The names mentioned by Russell are the only ones known to me in India. These "Mutta pam," mud snake, and

* Ind. Serp., Vol. I, pl. XXX.

"Ally pam" are presumably in use in the Vizagapatam District. In most places in India I expect it would come under that very comprehensive title "pani ka samp." Günther mentions "oular ayer" as the name by which it is known to the natives in Java, and Flower says—"In Siam it is called "Ngu-pla," or fish snake, in common with other homalopsids.

General characters.—The head is moderately depressed and the snout evenly rounded so as to present no canthus. The muzzle is rather long, and presents a moderately rounded anterior outline. The nostrils which are transverse slits, are placed on the top of the snout, and perforate the middle of the nasal shields, a suture running from them to the first supralabials. The eye is rather small, placed high on the face and set laterally with an inclination forwards and upwards. The iris is studded with golden specks, especially at the pupillary margin so that the vertically elliptic shape of the pupil is distinctly revealed. The commissure of the mouth turns up abruptly behind.

The body is smooth glossy and cylindrical, of moderate calibre for the length of the snake and dwindles to a neck anteriorly. Posteriorly the attenuation is more gradual. The tail is about one-fifth the total length.

Dimensions.—I have seen no specimens exceeding the measurement given by Boulenger which is 2 feet $2\frac{3}{4}$ inches (680 mm). My largest specimen was 2 inches less.

Colouration.—Dorsally the snake is a dark olivaceous green, or olivaceous brown, this colour ending abruptly on the 3rd costal row above the ventrals, and just above the supralabial on the side of the face. Usually there is a pale stripe down the body on the 8th row above the ventrals, but this may be obscure or even absent. The belly and the lowermost two and a half costal rows are pale lemon-yellow. The ventrals are demarcated laterally by a dark line and there is often too a median continuous, or interrupted dark line in the middle of the belly, but this may be entirely absent.

(*H. bilineata* and *H. furcata* (Gray). A specimen sent to me by Captain Frere from Mambu, Burma, has a beautiful coral-pink stripe in the flanks, anteriorly on two rows (the penultimate and

THE COMMON INDIAN SNAKES.

Hypsirhina enhydris.

EXPLANATION OF DIAGRAM.

A. S.	Anterior Sublinguals.
F.	Frontal.
Int.	Internasals.
Lor.	Loreal.
M.	Mental.
N.	Nasal.
Pa.	Parietal.
Po.	Postocular.
Pr.	Preocular.
Prf.	Præfrontal.
P. S.	Posterior Sublingual.
R.	Rostral.
S.	Supraocular.
T.	Temporal.
1 to 8.	Supralabials.
1 to VI.	Infralabials.

ante-penultimate), later on the penultimate only. This stripe begins behind the neck and ends before the vent. The specimen otherwise is like Indian examples. Flower records a specimen from Kedah in the Malay Peninsula which appears to have had five ventral lines instead of the normal three.)

Identification.—This is very easy. First note that the nasal shields are in contact behind the rostral, then count the scale rows in midbody which will be found to be 21 to 23.

Disposition.—I cannot recall ever having seen a live specimen, but Dr. Cantor who appears to have been very familiar with it says it is a timid inoffensive snake.

Habits.—Schneider's water snake is thoroughly aquatic in habit, as might be inferred from the character, and position of its nostrils. It frequents rivers, estuaries, lakes and marshy ground, even being found according to Cantor in irrigated fields.

Food.—Dr. Cantor states that it feeds on fishes under natural conditions, though these were not acceptable in captivity.

Breeding.—Captain (now Colonel) G. H. Evans came across a pair "in copula" at Hmawbi (Lower Burma) on the 16th October * 1899, which were unfortunately despatched instead of being kept for the fruits of their intercourse. The two snakes measured 1 foot $8\frac{1}{2}$ inches and 1 foot $8\frac{3}{4}$ inches, and though the sexes were not at the time ascertained we may presume the former to have been the ♀ by the numbers of the ventral and subcaudal shields, which were 169 + 67. In the longer specimen these shields counted 161 + 72. Another ♀ was taken by Theobald † near Rangoon in a gravid condition in March. She measured 18 inches and contained 6 eggs. Although it is definitely known that the species is viviparous from Cantor's observations, the period of gestation is not known as it appears from his account that a ♂ shared the incarceration. Apparently congress was not witnessed but after six months' captivity the ♀ gave birth to 11 young. During parturition it was observed that the anterior part of the

* Not as originally reported November.

† Cat. Rept. Brit. Burma, p. 57.

abdomen was retracted towards the spine. The mother died immediately after the event, and two of her brood within two hours. These were noted to have measured 6 and $6\frac{1}{4}$ inches. The young sloughed immediately after birth, even the two that succumbed so soon having accomplished this function. The remainder of the family wreathed themselves round the ♂, lifting their heads at intervals to the surface to breathe. All died within two months. The season when the event took place is not noted.

Parasites.—A specimen sent to me from Champaran (Behar) had numerous nematodes in the stomach, probably the same worm that is so frequently seen in the stomach of the chequered keel-back (*Tropidonotus piscator*) and other snakes. I took it to be this worm, viz., *Kallicephalus willeyi*. As a result of this parasitic invasion the organ was much thickened, and its walls rigid and distorted.

Distribution.—North-East India, Assam, Burma, and the South of the Asian Continent through Indo-China to China. Tenasserim, Malay Peninsula to the Archipelago as far East as Celebes.

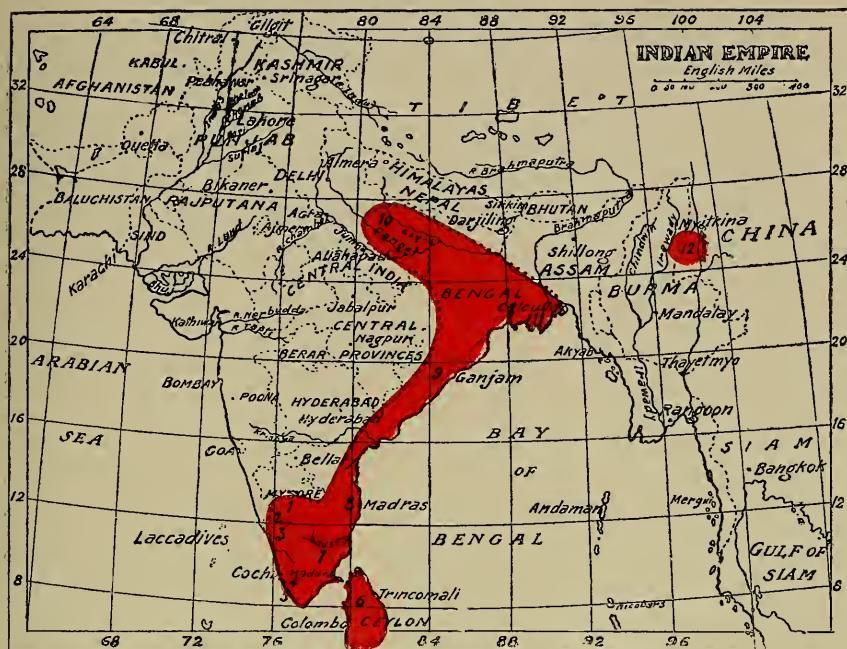
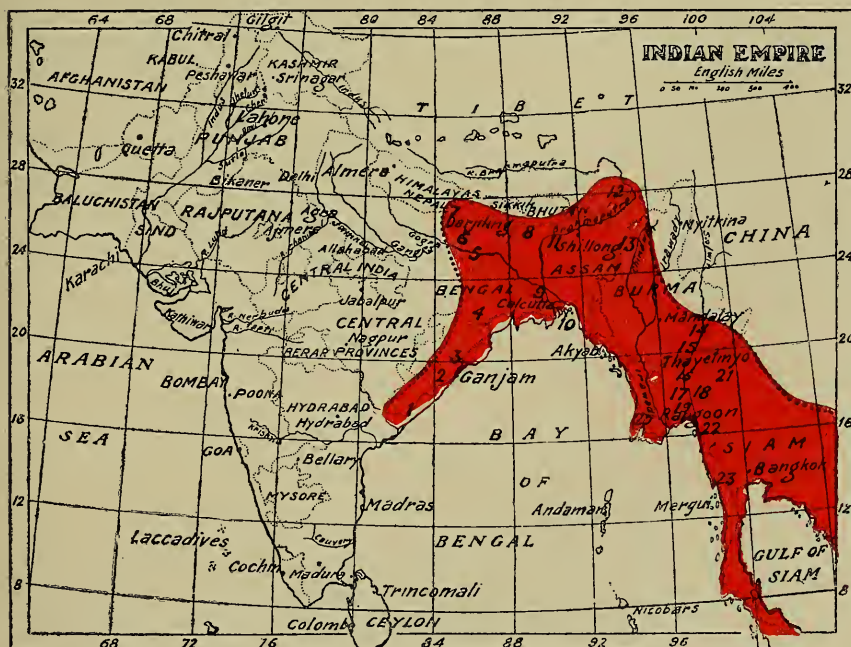
Though Ceylon is mentioned by Flower and Boulenger (Cat. 1896) I can find no authority for this. It was not mentioned in Haly's list of Ceylon snakes in 1891, nor in Willey's list published as recently as 1906 (Spol. Zeylan. April 1906, p. 233). Further though Jerdon says it occurs in Southern India I can find no record of it south of the Godavery River. There is a specimen in the British Museum presented by Jerdon, and reported as from Darjeeling. This in all probability means Darjeeling District, and probably came from the base of the Himalayas. I have had a specimen from Jalpaiguri in the same neighbourhood. Though known from Burma and Tenasserim it has not as yet been reported from the Andamans or Nicobars.

The precise localities known to me are shown in the accompanying map.

It may be a commoner snake in India than available records make it appear. In Assam too the same remark may apply. In Burma Theobald says it is common in the Pegu District, and Evans and I collected 9 specimens in 15 months, in the Lower part of that Province.

Distribution of *Helicops schistosus*.

.....Implies limits uncertain.

Distribution of *Hypsirhina enhydris*.

Lepidosia.—*Rostral*.—Touches 4 shields. *Nasals*.—In contact behind the rostral; semi-divided; in contact with only the 1st of the supralabial series. *Internasal*.—Single, broader than long. *Præfrontals*.—A pair; in contact with internasal, loreal, præocular and supraocular. *Frontal*.—Touches 6 shields, the fronto-supraocular sutures longest. *Supraocular*.—Breadth and length rather less than frontal. *Loreal*.—One. *Præocular*.—One. *Postoculars*.—Two. *Temporal*.—One. *Supralabials*.—8 normally, the 4th only touching the eye. *Infralabials*.—6; the 6th longest, the 3rd, 4th, 5th and 6th, or the three latter only touching the posterior sublinguals. *Sublinguals*.—Two pairs; the anterior larger. The posterior quite separated by scales. *Costals*.—Two headlengths behind head usually 23 (rarely 25), midbody usually 21 (rarely 23), two headlengths before vent 21; smooth. *Ventrals*.—150 to 177, rather narrow so that 3 or 4 rows of costals can be seen on each side when the snake is laid on its back. *Anal*.—Divided. *Subcaudals*.—47 to 78, divided.

Anomalies.—I have seen two præoculars once, and two temporals once. The last two ventrals were divided in one specimen, and the last only in another. In another example the 38th to 54th subcaudals were entire.

Dentition.—Maxillary teeth 17, subequal; followed after a short gap that would take one tooth, by a pair of enlarged, obliquely set teeth deeply grooved on their anterior faces. *Palatine*.—10 to 11 subequal, as well developed as the maxillary. *Pterygoid*.—18 to 24, as well developed anteriorly as the maxillary; decreasing in size posteriorly. *Mandibular*.—23 to 24, subequal as long as the maxillary.

Our plate is excellent in every particular.

(To be continued.)

PLANTS OF THE PUNJAB.

A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB,
NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

By

Colonel C. J. BAMBER, F.L.S.,

Indian Medical Service.

PART X.

(Continued from page 228 of this Volume.)

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

Lavatera kashmiriana,

MALVACEÆ.

F. B. I. i. 319.

Kashmir.

Hazara, 7-8,000 ft.

stems covered with down, branching; leaves lower, 5-lobed, circular, heart-shaped at the base, round-toothed, smooth above, downy beneath, stalk as long as the blade, upper 3-5 lobed, lobes short-pointed, central longest, stipules linear-lanceolate; flowers 3 in. diam., pink, on axillary stalks, bracteoles 3, united below, broadly ovate, shortly pointed, sepals 5, lanceolate, longer than the bracteoles, petals 5, united below, wedge-shaped, deeply bifid, stamens united into a column, woolly, styles many; carpels many, separating from the axis, kidney-shaped, smooth, shorter than the axis seeds one in each carpel.

Malva verticillata,

MALVACEÆ.

F. B. I. i. 320.

The Plains to 12,000 ft.

Simla, Matiana (Collett).

large, branched, downy, annual or perennial; leaves 2-6 in. diam., nearly round, 5-6 shallow lobes, downy, stalks 6-7 in., stipules lanceolate, hairy; flowers small, pale pink crowded in nearly sessile axillary clusters, bracteoles 3, ununited, linear, sepals 5, united below, triangular lanceolate, petal 5, united below, twice the length of the sepals, margin notched, stamens united into a tube, styles

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

10-12; carpels 10-12, enclosed in the enlarged calyx, netted on the sides, ribbed at the back, each carpel one-seeded. This plant is sometimes used as a potherb.

Malva sylvestris,*Large mallow,*

MALVACEÆ.

F. B. I. i. 320.

The Plains to 8,000 ft.

Theog (Collett).

Kashmir.

Hazara.

medium-size, annual, smooth or with a few hairs; leaves 1-3 in. diam., 5-7 blunt, shallow lobes, rounded, base heart-shaped, stalks 1-3 in., stipules oval, short-pointed; flowers 1-1½ in. diam., pink streaked with purple, on axillary stalks, 1 in. long, bracteoles ovate, shorter than the bell-shaped calyx, petals with bearded stalked bases, carpels downy or not, netted; otherwise like the last species.

Abutilon graveolens,

see Herbs, Erect, Alternate, Stipulate, Simple.

Urena repanda,

MALVACEÆ.

F. B. I. i. 330.

The Plains to 1,000 ft.

East of the Sutlej.

medium-size, perennial, much branched, covered with star-shaped hairs; leaves, lower 2-2½ in. long, roundish, somewhat lobed, heart-shaped base, slightly toothed with rounded notches, upper lanceolate, stipules linear; flowers ⅔ in. pink in racemes, ultimately in leafless clusters, bracteoles 5, ¼-½ in., awl-shaped, united below into a strongly ribbed cup, nearly leathery, larger than the calyx, sepals 5, united half way up, stamens united into a tube, styles 10; carpels 5, smooth, separating from the axis when ripe, each carpel one-seeded, seeds smooth.

Hibiscus Trionum,

MALVACEÆ.

F. B. I. i. 334.

The Plains to 6,000 ft.

Kashmir.

Hazara.

Sutlej Valley (Collett).

Baluchistan (Lace).

medium-size, annual, more or less covered with star-shaped hairs; leaves 1-1½ in., divided to the base (lower leaves sometimes circular, undivided), lobes usually 3, lobed and toothed, stalks 1-1½ in. long, stipules awl-shaped, covered with long stiff hairs; flowers 1½ in. diam., pale yellow with a dark-purple centre, calyx 5-lobed to the middle, bell-shaped, inflated, lobes broad, short pointed, nerves

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

hairy winding, afterwards purple, petals 5, united below and with the staminal tube, stamens united into a tube, styles 5, united half way up; capsule oblong, blunt, 5-celled, velvety, splitting from above into 5 valves, seeds many, kidney-shaped, velvety with star-shaped hairs.

Hibiscus surattensis,

see Prostrate Herbs, Alternate, Stipulate, Lobed.

Hibiscus Solandra,

MALVACEÆ.

F. B. I. i. 336.

The Plains to 5,000 ft.

Simla.

Sutlej Valley (Collett).

medium-size, annual, velvety or hairy, slightly branched; leaves 1-2½ in. across, heart-shaped at the base, short-pointed, coarsely toothed, hairy on both sides, lower leaves long-stalked, ovate or circular, more or less 3-lobed, upper deeply 3-lobed, lobes narrowly oblong, stipules bristly; flowers ½-¾ in. diam., yellow, white or pink on solitary jointed axillary stalks, 1½ in. long, in a loose leafless terminal raceme, sepals united below, triangular, short pointed, petals broad at the tip, notched; capsule ovoid, pointed, hairy at the top, not longer than the calyx, seeds blackish; otherwise like *Hibiscus Trionum*.

Hibiscus vitifolius,

Ban kapás.

MALVACEÆ.

F. B. I. i. 338.

The Plains to 2,000 ft.

large, annual or biennial, hairy, slightly prickly, branches many; leaves 1-4 in. diam., 3-7 lobed, lobes short-or long-pointed, smooth or felted on both surfaces, toothed, stalks 2½ in., stipules very small, bristly; flowers 2½ in. diam., yellow with a purple centre, drooping on axillary, solitary or clustered at the end of branches, stalks jointed bracteoles 5-8, bristly, linear, not united and shorter than the calyx, sepals united half way up, lanceolate, velvety, petals two or three times as long as the sepals, capsule hairy, beaked, 5-winged, shorter than the sepals, seeds brown, tubercled; otherwise like the last species. The bark yields a strong silvery fibre.

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

Hibiscus Gibsoni,

MALVACEÆ.

F. B. I. i. 339.

The Plains.

medium-size, perennial, branches bristly or prickly; leaves 1-3 in., deeply divided into lobes, lobes oblong-lanceolate, toothed, smooth or hairy, stalk as long as the blade; flowers twice the length of the bracteoles, yellow with a purple centre or all purple, on solitary axillary stalks, bracteoles ununited, linear, prickly, curving over the calyx, sepals united below, lanceolate, staminal tube half covered with anthers, capsule ovoid, pointed, valves bristly, seeds soft with scattered hairs; in other points like the last species.

Hibiscus Sabdariffa,**Rozelle or Red sorrel,***Patwa.*

MALVACEÆ.

F. B. I. i. 340.

The Plains cultivated.

large, annual, smooth, stem purplish; leaves 2-3 in., wedge-shaped at the base, usually 3-5 lobed, lower leaves are sometimes not lobed, lobes lanceolate or oblong, glandular beneath, toothed, stalk 2 in., reddish, stipules $\frac{1}{2}$ in. long, linear, short pointed; flowers $2\frac{1}{2}$ in. diam., yellow or purple on solitary axillary short stalks, thickened at the top, bracteoles 8-12, united to the base of the calyx, calyx enlarging in fruit, sepals united below the middle into a fleshy purple cap, bristly, capsule ovoid, pointed, hairy, shorter than the calyx, seeds nearly glabrous, kidney-shaped; otherwise like the last species. This plant is cultivated for the sake of the edible calyx, from which an acid jelly is prepared; it is used as a preventive of scurvy. The stems supply a strong silky fibre.

Hibiscus ficulneus,

MALVACEÆ.

F. B. I. i. 340.

The Plains.

very large, annual, branches usually covered with broad-based sharp prickles; leaves $2\frac{1}{2}$ -4 in., 5-7-lobed, with wide sinuses between the lobes, lobes broad at the tip, narrow at the base, unequally toothed stalks $2\frac{1}{2}$ -4 in., stipules $\frac{1}{4}$ in. long, linear, hairy, soon falling off; flowers 1-2 in. diam., white with a pink centre, on stalks, $\frac{1}{2}$ the length of the leaf stalks, the upper in a leafless raceme, bracteoles 4-6, broad, leafy, sepals united nearly entirely, tips

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

thread-like, capsule $1\frac{1}{2}$ in. long, ovoid, felted, with a curved beak, 5-angled, sticky when young, seeds round, softly hairy; otherwise like the last species.

Hibiscus pungens

MALVACEÆ.

F. B. I. i. 341.

Himalaya, 2-5,000 ft.

(Duthie).

medium-size, annual or perennial, branches bristly and dotted; leaves 5-8 in., heart-shaped, 7-lobed, lobes linear-lanceolate, long pointed, deeply toothed, upper 3-lobed, stalk longer than the blade. stipules broadly lanceolate, upper ones linear; flowers 5 in. diam., yellow with a purple centre drooping on racemose stalks 1-2 in. long, bracteoles 1 in., enlarging in fruit, calyx 5-toothed, staminal column with anthers all the way up, capsule $\frac{3}{4}$ in. long, slender, hairy; otherwise like the last species.

Hibiscus Abelmoschus,**Musk mallow,***Mushk dana, Kasturi
bhendi.*

MALVACEÆ.

F. B. I. i. 342.

The Plains.

large, annual, hairy, branched; leaves heart-shaped, ovate or usually 3-7-lobed, lobes oblong-lanceolate, short or long-pointed, coarsely toothed, hairy above or below, stalk longer than the blade, stipules small, awl-shaped; flowers 3-4 in. diam., yellow with a crimson centre, solitary, often apparently terminal on stout curved stalks, bracteoles 6-12, linear, ununited, hairy, much shorter than the calyx, sepals united except the 5 tips, split down on one side, capsule $2\frac{1}{2}$ -3 in., ovate, short-pointed, hairy, seeds kidney-shaped, with a musky scent; otherwise like the last species. Musk is obtained from this plant and it also yields a strong fibre, it is cultivated for these reasons.

Hibiscus cancellatus,

MALVACEÆ.

F. B. I. i. 342.

The Plains to 6,000 ft.

Simla, Syri (Collett).

Hazara (Douie).

large, annual, bristly, root spindle-shaped; leaves 4-6 in., bluntly five-angled, or rounded, round toothed, hairy, upper leaves with angular lobes at the base, stalks 4 in., stipules linear; flowers 4-5 in. diam., drooping, yellow with a purple centre on stalks much shorter than the leaf-stalks, racemed at the ends of branches, bracts 2 at the base of each stalk, awl-shaped, bracteoles 10-18, $1\frac{1}{2}$ in. long, linear, bristly, incurved, capsule ovoid, furrowed, very hairy, equal in length to the bracteoles.

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

seeds many, kidney-shaped, black, not musky; otherwise like the last species.

Hibiscus esculentus,
Ckra.

Bhindi, ramturai.

MALVACEÆ.

F. B. I. i. 343.

The Plains to 4,000 ft.
cultivated.

large, annual, roughly hairy; leaves 8-12 in. long, 3-5-lobed, heart-shaped at the base, lobes lanceolate-oblong, coarsely toothed, rough, stalk as long as the blade, reddish, stipules linear; flowers large, yellow with a crimson centre on stout short stalks, shorter than the leaf-stalks, bracteoles 8-10, linear, equal in length to the calyx, soon falling off, capsule 6-10 in. long, oblong, tapering, 6-8 ribbed, smooth or hairy seeds many, round, with lines, smooth or hairy, otherwise like the last species. This plant is commonly cultivated as an unripe capsule and seeds are eaten as a vegetable. It yields a silky fibre which is used in paper making.

Pentapetes phœnicea,
Dopahariya.

STERCULIACEÆ.

F. B. I. i. 371.

The Plains in wet
places.

large, annual, smooth or bearing a few scattered star-shaped hairs, branched; leaves 3-5 in., triangular or lanceolate with two lobes at the base, round-toothed, smooth above, star-shaped hairs on the veins beneath, stalk 1 in., stipules linear, equal in length to the stalk; flowers 1-1½ in., scarlet, open at noon, drop next morning, one or two together on jointed axillary stalks, bracteoles 3-5, thread-like, half the length of the calyx, soon falling off, sepals 5, lanceolate, united below, rough, petals 5, ovate with a broad tip, stamens 20, 15 fertile in 5 groups of three, alternating with 5 unfertile (staminodes) style dividing above and twisted, stigmas 5, minute; capsule ½ in. diam., nearly round, bristly with star-shaped hairs, shorter than the persistent sepals, seeds 8-12, in two rows in each of the 5 cells, angular rough.

FLOWERS, MINUTE, IN HEADS.

FLOWERS, ALL TUBULAR.

Artemisia Dracunculus,

see Herbs, Erect, Alternate, Exstipulate, Lobed.

Artemisia parviflora,

see Herbs, Erect, Alternate, Exstipulate, Lobed.

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS UNITED.

FLOWERS, MINUTE, IN HEADS.

FLOWERS, ALL TUBULAR.

Artemisia scoparia,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia annua,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia maritima,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia vulgaris,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia Roxburghiana,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia vestita,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia laciniata,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia Moorcroftiana,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia Absinthium,	see Herbs, Erect, Alternate, Exstipulate, Lobed.
Artemisia Sieversiana,	see Herbs, Erect, Alternate, Exstipulate, Lobed.

PETALS NONE.

Rumex hastatus,	medium-size, perennial root, stems and branches
POLYGONACEÆ.	grooved, smooth; leaves $1-2\frac{1}{2}$ by $\frac{3}{4}-2$ in., stalked,
F. B. I. v. 60.	3-lobed, two lobes projecting backwards, narrow, or
Himalaya, 1-8,000 ft.	not lobed, broadly triangular, long pointed, stipules
Kashmir.	tubular, thin, not fringed, soon torn and disappearing;
Simla (Collett).	flowers green, small, males and females,
Hazara (Barrett).	often turning red, in circular distant clusters
	forming axillary racemes and terminal branching
	racemes, often crowded in fruit, calyx 6-lobed, in
	fruit circular, pink, not fringed, notched at both
	ends, petals none, stamens 6, styles 3, stigmas fringed;
	nut sharply 3-angled, brown, enclosed in the
	three inner segments of the calyx.

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS NONE.

Rumex acetosa, like the last species, but male and female flowers
 POLYGONACEÆ. on separate plants, branches few, racemes leafless,
 F. B. I. v. 60. outer sepals reflexed.
 Himalaya, 8-12,000 ft.
 Kashmir.

Cannabis sativa, large, annual, stems gooved, felted, branches few.
Indian Hemp, erect, slender, a common weed, also cultivated, leaves
Bhang. 4-8 in. diam., opposite, stalked, much divided, upper
 URTICACEÆ. leaves 1-5 lobed, lower 5-11 lobed, linear-lanceolate,
 F. B. I. v. 487. middle lobe longest, coarsely and sharply toothed,
 The Plains to 9,000 ft. long pointed, wedge-shaped at the base, dark green
 Hazara (Barrett). above, downy below, stipules lateral, awl-shaped,
 Simla (Collett). bristly; flowers greenish yellow, small, male and
 Baluchistan (Hughes- female on separate plants, males clustered in short,
 Buller). axillary, drooping branched racemes, calyx of 5 seg-
 ments, segments boat-shaped, petals none, stamens
 5, filaments long, thread-like, females crowded, ses-
 sile in the axils of leafy bracts, style arms 2, thread-
 like; achenes 1-12 in., flattened, hard, enclosed in
 the persistent bracts. The intoxicating drugs,
 ganja and charas consist of the resin obtained from
 the stem, young leaves and flowers, bhang is merely
 the dried leaves and achenes. Hemp is obtained
 from the fibrous stems.

Girardinia heterophylla, large, annual, root perennial, stem and branches
Ker. furrowed, covered with very long stinging hairs like
 URTICACEÆ. a nettle; leaves 4-12 in. long and broad, long-stalked,
 F. B. I. v. 550. 3-nerved from the base, broadly ovate, upper leaves
 Himalaya, 5-8,000 ft. 3-5 lobed, heart-shaped at the base, sharply toothed,
 Hazara (Barrett). stipules large, united, leaf-like, divided at the tip;
 Simla (Collett). flowers small, green, sessile, closely crowded, male
 and female on the same or separate plants, when
 male and female are together, the male are in nearly
 cylindric clusters on the lower part of the spike, and
 the female in clustered heads in the upper part,
 when separate, male in long slender, often branched
 spikes, and female in short oblong spikes, in fruit
 becoming thick and densely bristly; male flowers,

HERBS, ERECT, WITH ALTERNATE STIPULATE LOBED LEAVES.

PETALS NONE.

calyx of 4 sepals, petals none, stamens 4, female flowers calyx tubular with a small 3-toothed mouth, splitting in fruit, style long, thread-like, persistent, stigma minute; capsule (achene) broad, flattened, ovate, black.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

***Thermopsis barbata*,**

LEGUMINOSÆ.

F. B. I. ii. 62.

Himalaya, 8-12,000 ft.
Kashmir.

Patarnala (Collett).

small to medium-size, perennial, rootstock woody, stems tufted, branches many, densely shaggy; leaves of 3 sessile leaflets with leaf-like stipules at the base, each node appearing to have a tuft of simple leaves, leaflets smooth or hairy, lanceolate, 1-2 in., entire; flowers dark-purple, 1 in. long, clustered in short axillary racemes forming a terminal branched raceme, bracts shaggy, united at the base or free, calyx top-shaped, 5-toothed, teeth lanceolate, two upper more or less united, three lower twice the tube, petals 5, all long stalked, posterior (standard) largest, circular, sides turned back, 2 wing petals, ovate, outer part broader, 2 keel petals faintly joined, oblong-ovate, stamens 10, ununited, style thread-like, incurved; pet 1-2 by $\frac{1}{2}$ - $\frac{5}{8}$ in., linear-oblong, short-pointed, seeds 2-6.

***Argyrolobium roseum*,**

LEGUMINOSÆ.

F. B. I. ii. 64.

The Plains to 6,000 ft.
Rawalpindi.

Kahuta (Douie).

Baluchistan (Boissier).

small, perennial, thinly silky, branches slender, spreading or prostrate; leaves digitately compound, leaflets 3, $\frac{1}{3}$ in., ovate with a broad rounded tip, base wedge-shaped, sessile, leaf-stalk equal to or shorter than the leaves, stipules minute, linear, persistent, ununited; flowers $\frac{3}{8}$ in., pink or yellow tinged with pink in 1-4 flowered leaf-opposed stalked racemes, longer than the leaves, calyx $\frac{1}{4}$ in., 2-lipped, slit nearly to the base, 5 distinct teeth, 2 to the upper, 3 to the lower lip, smooth, lanceolate, petals 5, hardly longer than the calyx, standard oblong-circular, notched longer than the upper lip of

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

the calyx, wings oblong, keel broadly oblong, blunt, shorter than the standard, stamens 10, all united, 5 longer with large anthers attached at the end, 5 shorter with smaller anthers attached in the middle, style long, thread-like, incurved; pod $\frac{3}{4}$ in. long, erect, straight, narrow, flattened, seeds 10-15.

Lotononis Leobordea,
LEGUMINOSÆ.
F. B. I. ii. 64.
Peshawar (Stewart).
Baluchistan (Hughes-
Buller).

small, annual, finely silky, branches many, spreading; leaves digitately compound, leaflets 3, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, lanceolate, rather fleshy, tip blunt, broad, with a minutely fine point, leaf stalks as long as the leaves, stipules minute, lanceolate, soon falling off; flowers $\frac{1}{4}$ in., pale yellow or red, nearly sessile, 1-5, in the axils of most of the leaves, calyx $\frac{1}{8}$ - $\frac{1}{5}$ in., silky teeth 5, lowest tooth deepest, petals 5, a little longer than the calyx, standard narrow, wings shorter, narrower, keel petals firmly united, longer, tip sharply incurved, stamens 10, united in a tube, slit along the top, anthers as in the last species; pod linear-oblong, scarcely longer than the calyx, seeds 4-8.

Grotalaria medicaginea,

see Prostrate Herbs, Alternate, Stipulate, Compound.

Ononis hircina,

see Shrubs, Erect, Alternate, Stipulate, Compound.

Trifolium pratense,

see Prostrate Herbs, Alternate, Stipulate, Compound.

Trigonella

Fœnum-græcum,

Fenugreek,

Methi.

LEGUMINOSÆ.

F. B. I. ii. 87.

The Plains to 5,000 ft.

Kashmir.

Hazara.

Baluchistan (Lace).

medium-size, annual, cultivated, strongly scented, robust, nearly smooth; leaves pinnately compound, leaflets $\frac{3}{4}$ -1 in. long, lanceolate-oblong, tip broad, toothed, lateral nearly sessile, terminal stalked nerves prominent running into the teeth, stipules lanceolate, entire, long pointed, united to the leaf-stalk; flowers small, pale yellow in short racemes at the end of axillary stalk, often bristle tipped, calyx $\frac{1}{4}$ - $\frac{1}{3}$ in., bell-shaped, teeth 5, distinct, linear, petals 5, narrow, standard and wings nearly equal, keel

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

shorter, blunt, a little longer than the calyx, stamens 10, upper nearly or quite free, others united; pod 2-3 in. long, often curved, long-beaked, seeds 10-20. This plant is cultivated as a fodder crop and a pot herb, the seeds are used as a spice and as a medicine.

Trigonella polycerata, see Prostrate Herbs, Alternate, Stipulate, Compound.

Trigonella Emodi, medium size, often robust, smooth, much branched; leaflets 3. $\frac{1}{3}$ - $\frac{3}{4}$ in. long, ovate with a broad tip, deeply toothed; stipules linear bristly, deeply toothed; flowers 4-6 rarely 12, racemes on stalks 1-2 in. long, terminating in a distinct point, calyx $\frac{1}{8}$ - $\frac{1}{6}$ in., smooth, teeth linear as long as the tube corolla twice or thrice as long as the calyx; pod $\frac{1}{2}$ - $\frac{3}{4}$ by $\frac{1}{8}$ - $\frac{1}{6}$ in., linear-oblong, smooth, straight, seeds 4-6; otherwise like the last described species.

LEGUMINOSÆ.
F. B. I. ii. 88.
Himalaya, 4-11,000 ft.
Kashmir.
Marali.
Baluchistan (Hughes-Buller).

Trigonella corniculata, very like the last species, but the calyx teeth are shorter, the pod is recurved instead of straight.

LEGUMINOSÆ.
F. B. I. ii. 88.
The Plains to 12,000 ft.
Kashmir.
Simla (Collett).

Melilotus parviflora, medium size, annual, slender, leaves pinnately compound, leaflets $\frac{1}{4}$ - $\frac{1}{2}$ in., ovate or oblong, only upper part toothed, base entire, lateral leaflets nearly sessile, terminal one stalked, nerves prolonged to the teeth, stipules linear, long-pointed, united to the leaf-stalk, apex notched; flowers $\frac{1}{12}$ in., yellow in long axillary racemes, 1 in. long, in fruit lengthened to 2 in., calyx $\frac{1}{4}$ in., teeth 5, triangular, petals 5, $\frac{1}{12}$ in. soon falling off; pod $\frac{1}{12}$ - $\frac{1}{8}$ in., tipped by the style, one-seeded. This plant

or indica,
Melilot,
Sinji, metha.
LEGUMINOSÆ.
The Plains to 3,000 ft.
Joengi.
Mianwalli District.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

is a common weed in cornfields, and is sometimes cultivated as a fodder crop.

Melilotus alba,

White Melilot,

LEGUMINOSÆ.

F. B. I. ii. 89.

The Plains to 13,000 ft.

Simla (Collett).

Mianwalli District.

very like the last species, but more robust and taller, the racemes, flowers and pod are larger, and the latter is often two-seeded. This plant is also used for fodder, and is fragrant when drying.

Medicago falcata,

Medick, non-such,

LEGUMINOSÆ.

F. B. I. ii. 90.

Himalaya, 5-10,000 ft.

Mashobra (Collett).

Kashmir.

medium size, perennial, nearly smooth, branches many: leaves pinnately compound, leaflets 3, $\frac{1}{2}$ -1 in. long, narrowly oblong, upper part toothed, base entire, lateral leaflets sessile, terminal one stalked, nerves prolonged to the teeth, stipules narrowly lanceolate, long-pointed, united to the leaf-stalk; flowers $\frac{1}{8}$ in., yellow in axillary stalked racemes, calyx $\frac{1}{8}$ in., bell-shaped, teeth 5, bristlelike, nearly equal, as long as the tube, petals 5, standard petal not stalked, keel shorter than the wing petals, blunt, corolla twice as long as the calyx, stamens 10, upper one free, others united, style smooth, incurved; pod $\frac{1}{2}$ - $\frac{3}{4}$ in. long, sickle-shaped, smooth, seed, 5-10.

Medicago sativa,

Lucerne,

Alfafa.

LEGUMINOSÆ.

F. B. I. ii. 90.

The Plains to 5,000 ft.

Baluchistan (Boissier).

very like the last species, of which it may be the cultivated variety, but is more erect, less branched; flowers purple or blue, and pods rough, twisted into a double spiral. This plant is widely cultivated as a fodder crop.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

- Cyamopsis psoroides**, medium size, annual, robust, covered with laterally attached grey hairs, stems 4-sided; leaves stalked, leaflets 3, 2-3 in. long, ovate, short-pointed, deeply toothed, stipules linear-bristle-like; flowers $\frac{1}{4}$ in., purplish, in shortly stalked 6-30 crowded axillary racemes, bracts bristle-like, projecting beyond the buds, calyx $\frac{1}{8}$ - $\frac{1}{4}$ in., tube oblique, teeth 5, unequal, lowest long, bristle-like, petals 5, just protruding from the calyx, soon falling off, standard and wing petals narrow, keel blunt, slightly incurved, stamens 10, united, style short, much incurved; pod $1\frac{1}{2}$ -2 in. long, straight, thick, fleshy, erect, 3-keeled on back, seeds 8-12.
- Kulthi, guār.*
LEGUMINOSÆ.
F. B. I. ii. 92.
The Plains.
Rawalpindi (Aitchison).
Baluchistan (Hughes-Buller).
- Indigofera trifoliata**, see Prostrate Herbs, Alternate, Stipulate, Compound.
- Indigofera trita**, see Shrubs, Erect, Alternate, Stipulate, Compound.
- Taverniera nummularia**, see Shrubs, Erect, Alternate, Stipulate, Compound.
- Ebenus stellata**, see Shrubs, Erect, Alternate, Stipulate, Compound.
- Lespedeza juncea**, see Shrubs, Erect, Alternate, Stipulate, Compound.
- Lespedeza Gerardiana**, see Shrubs, Erect, Alternate, Stipulate, Compound.
- Lespedeza elegans**, see Shrubs, Erect, Alternate, Stipulate, Compound.
- Lourea vespertilionis**, see Herbs, Erect, Alternate, Stipulate, Lobed.
- Uraria picta**, see Herbs, Erect, Alternate, Stipulate, Compound, Leaflets many.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS DISSIMILAR.

Uraria lagopus, see Shrubs, Erect, Alternate, Stipulate, Compound, Leaflets Three.

Uraria neglecta, see Shrubs, Erect, Alternate, Stipulate, Compound, Leaflets Three.

Zornia biphylla.

LEGUMINOSÆ.

F. B. I. ii. 147.

The Plains to 5,000 ft.

Valleys below Simla
(Collett).

small, annual, stems several, slender, branches wiry, zigzag, hairy or velvety, tufted; leaves stalked, leaflets 2, $\frac{1}{2}$ -1 in., lanceolate, leathery, dotted with black glands, stipules leaflike, lanceolate, produced down in a spur; flowers $\frac{1}{4}$ in. long, yellow, sessile in erect axillary racemes, 1-3 in., each flower almost hidden in a pair of leaf-like fringed bracts, calyx minute, membranous, teeth 5, 2 upper united, 2 lateral very short, lowest equal to the upper, petals 5, standard round, keel sharply incurved, blunt, twice as long as the calyx, stamens 10, united into a tube, 5 longer with round anthers, alternating with 5 shorter with oblong anthers, style smooth, incurved; pod flattened, minutely prickly, protruding from the bracts, upper margin nearly straight, lower deeply indented, joints 2-5, seeds 2-5.

PETALS SIMILAR.

Rubus Clarkei

see Prostrate Herbs, Alternate, Stipulate, Compound.

Potentilla argyrophylla,

ROSACEÆ.

F. B. I. ii. 356.

Himalaya 8-13,000 ft.

Kashmir.

Matiana, Narkanda

(Collett).

large, perennial, rootstock very stout, stem velvety, robust; leaves digitately compound, leaflets 3, 2-3 in., sessile or stalked, ovate, coarsely toothed green, and finely hairy above, white-felted beneath, main leaf stalk, 2-3 in., stem stipules united at the leaf stalk, ovate-oblong, short pointed; flowers $\frac{3}{4}$ -1 $\frac{1}{4}$ in. diam., yellow or dark purple in terminal branched racemes, bracteoles 5, oblong, blunt, short or

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS TWO-THREE.

PETALS SIMILAR.

long pointed, calyx silky, persistent, lobes 5, alternating with the bracteoles, long-pointed, petals 5, heart-shaped with the notch outwards, stamens many, styles lateral, short, persistent; carpels very many, small, crowded on a small dry receptacle, fruit is a head of many hard smooth achenes, covered by the overlapping calyx lobes, achenes one-seeded.

LEAFLETS MANY.

PETALS DISSIMILAR.

Indigofera hirsuta,

LEGUMINOSÆ.

F. B. I. ii. 98.

The Plains to 4,000 ft.

large, annual or biennial, densely hairy, with flat-lying hairs; leaves pinnate, 2-5 in., shortly stalked, leaflets 5-11, 1-2 in. long, opposite, ovate with a broad tip, membranous, grey-green, stipules bristle-like, feathered; flowers $\frac{1}{3}$ in., red in dense slender hairy axillary racemes 2-6 in., long, bracts minute, calyx $\frac{1}{3}$ in., densely velvety, teeth 5, bristle-like, long feathered, petals 5, not much longer than the calyx, soon falling off, standard ovate with a broad tip, keel petals united, straight, not beaked, spurred on each side near the base, stamens 10, upper free, the rest united, anthers tipped with a minute point, style smooth, incurved; pod $\frac{1}{2}$ - $\frac{3}{4}$ in. long, cylindrical, densely velvety, 6-8 seeded.

Indigofera anabaptista,

LEGUMINOSÆ.

F. B. I. ii. 102.

The Plains.

small, annual, branches spreading, covered thinly with hairs like those of the last species, but always white; leaves pinnate, shortly stalked, leaflets 3-7, opposite, $\frac{1}{2}$ -1 in. long, lanceolate with a broad tip, stipules bristle-like, persistent; flowers $\frac{1}{6}$ in., scarcely longer than the calyx, in short dense, 12-20 flowered racemes, calyx $\frac{1}{6}$ in. silvery haired, teeth bristly, pod linear, reflexed; in other respects like the last species.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Tephrosia purpurea,
Sarphanki.

LEGUMINOSÆ.

F. B. I. ii. 112.

The Plains to 6,000 ft.

Simla (Collett).

Baluchistan (Hughes-
Buller.)

medium size, perennial, much branched, stems slender, cylindrical; leaves 3-6 in., pinnate, shortly stalked, stipules linear-awl-shaped, leaflets 13-21, narrow, lanceolate with a broad tip, blunt, green, smooth above, silky beneath; flowers $\frac{1}{4}$ - $\frac{3}{8}$ in., red, thinly silky in leaf opposed loose-flowered racemes, 3-6 in. long, bracteoles minute, calyx $\frac{1}{8}$ - $\frac{1}{6}$ in., silky, teeth 5, two upper teeth longer than the three lower, petals 5, $\frac{1}{4}$ - $\frac{3}{8}$ in., standard circular, silky without keel, petals united, blunt, stamens 10, upper free, others united, style curved, smooth, tuft of hairs at the tip; pod $1\frac{1}{2}$ -2 by $\frac{1}{8}$ in. sessile, velvety, flat, seeds 6-10.

Tephrosia villosa,

LEGUMINOSÆ.

F. B. I. ii. 113.

The Plains.

small, perennial, stems zigzag, woody, finely downy with white flat-lying hairs; leaves 2-3 in. long, nearly sessile, stipules linear, ascending or reflexed, leaflets 13-19, grey green, nearly smooth above, silky below, narrow lanceolate with the tip broad and often notched; flowers $\frac{2}{3}$ in., red in racemes, six or more inches long, lower flowers in distant separate clusters of stalks, bracts bristle-like, feathered, calyx $\frac{1}{8}$ - $\frac{1}{4}$ in., very silky, teeth 5, bristle-like, lower longer than the calyx tube, petals 5, not much longer than the calyx, stamens and style as in the last species, pod 1-1 $\frac{1}{4}$ in. long., $\frac{1}{8}$ - $\frac{1}{5}$ in. broad, densely velvety, curved, sharply bent down.

Tephrosia pauciflora,

LEGUMINOSÆ.

F. B. I. ii. 114.

The Plains.

Baluchistan (Lace.)

very like the last species, but leaflets 5-9, flowers stalked in pairs in the axils of leaves.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Sesbania aculeata,
Jayanti.

LEGUMINOSÆ.

F. B. I. ii. 115.

The Plains.

Baluchistan (Lace.)

large, annual, shrub-like, branches and under surface of leaf midribs armed with small hooked prickles; leaves 6-12 in., leaflets more numerous and smaller than those of *Sesbania ægyptiaca*, see Shrubs, leaflets 41-81, smooth; flowers $\frac{3}{8}$ - $\frac{1}{2}$ in., pale yellow dotted with red, in stalked loosely 3-6 flowered racemes, calyx 5-toothed, $\frac{1}{8}$ in., smooth, teeth short triangular, petals 5, stalked, standard petal broad, keel blunt, stamens 10, upper free, others united, style thread like, smooth, incurved, pod 6-9 in., linear, slightly curved, beaked, smooth: seeds many.

Astragalus Falconeri,
LEGUMINOSÆ.

F. B. I. ii. 120.

Hazara (Winter-
bottom).

large, perennial, stems almost woody, zigzag. velvety, white when young; leaves 1-1 $\frac{1}{2}$ in., midrib ending in a point or leaflet, stipules broad, leaf-like, leaflets 13-17, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, lanceolate oblong, with broad tips, blunt; flowers $\frac{1}{2}$ in., lilac, in long stalked few-flowered racemes, calyx $\frac{1}{6}$ in., pouched, nearly smooth, teeth 5, very short, petals 5, wing petals short-pointed equal to the keel petals, stamens 10, upper one free, others united, style incurved, smooth, pod $\frac{1}{2}$ - $\frac{5}{8}$ in., narrowed to both ends, stalk twice as long as the calyx, 4-6 seeded.

Astragalus trichocarpus,
LEGUMINOSÆ.

F. B. I. ii. 121.

Eastern Punjab.

Himalaya 5-8,000 ft.

Simla (Collett).

Dharmpur.

large, perennial, nearly smooth, branches straight, twiggy, much furrowed; leaves 2-4 in., nearly sessile, midrib ending in a point or leaflet, stipules minute, leaflets 31-41, $\frac{1}{8}$ - $\frac{5}{8}$ in., nearly blunt, pale green, covered with minute silvery hairs; flowers $\frac{1}{3}$ in., lilac crowded in stalked racemes, 3-4 in. long, bracts linear, minute calyx $\frac{1}{12}$ in., bell-shaped, oblique, smooth, teeth 5, triangular, petals 5, standard petal round, wings lanceolate shorter than the keel petals, stamens 10, upper free, others united, pod $\frac{3}{4}$ -1, stalked, oblong velvety, seeds 4-6.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Astragalus ciliolatus,

LEGUMINOSÆ.

F. B. I. ii. 129.

Himalaya, 6-9,000 ft.

Kashmir.

medium size, perennial, stems hollow, smooth; leaves 6-9 in., midrib ending in a point or leaflet; leaflets 17-19, $\frac{1}{2}$ - $1\frac{1}{2}$ in., oblong, blunt, green, smooth, stipules $\frac{1}{4}$ - $\frac{1}{2}$ in., lanceolate or triangular, free persistent; flowers $\frac{3}{4}$ in., yellow tinged with lilac, crowded nearly all on one side of long-stalked racemes. bracts linear, shorter than the buds, calyx $\frac{3}{8}$ in., tubular, oblique, teeth 5, bristle-like, feathered, petals 5, keel shorter than the standard and wing petals, broad, abruptly upcurved, stamens and style like those of the last species; pod 1 in., oblong, expanded, narrowed into a beak, covered with fine short spreading black hairs, stalk $\frac{3}{8}$ in., seeds 8-20.

Astragalus frigidus,

LEGUMINOSÆ.

F. B. I. ii. 130.

Lahoul.

medium size, perennial, stout, smooth; leaves 4-6 in. long, stipules $\frac{1}{2}$ - $\frac{3}{4}$ in. long, ovate or lanceolate, sharp-pointed or blunt, free, persistent, leaflets 9-15, oblong, one or more inches long, opposite, thin, smooth above, with a bluish waxy gloss and a few hairs below; flowers $\frac{3}{4}$ in., bright yellow arranged nearly all one side on long stalked racemes, calyx $\frac{3}{8}$ in., tubular, with a few flat-lying hairs, teeth 5, minute, petals 5, standard longer than the wings and keel petals, stamens and style as those of the last species; pod 1 in., expanded, smooth, oblong, stalked, narrowed to both ends, 6-8 seeded.

FLOWERS, IN HEADS, IN THE NEXT SEVEN SPECIES OF ASTRAGALUS,

AND TWO OF OXYTROPIS.

Astragalus prolixus,

LEGUMINOSÆ.

F. B. I. ii. 121.

The Plains.

Lahore.

small, annual weed, clothed densely with horizontal-lying white hairs, very slender; leaves $\frac{1}{2}$ - $1\frac{1}{2}$ in., distinctly stalked, stipules free, minute, lanceolate, leaflets 11-17, oblong, blunt, $\frac{1}{3}$ - $\frac{1}{4}$ in., covered with the horizontal white hairs; flowers $\frac{1}{10}$ in. yellow 6-12 together in heads on stalks a little shorter than the leaves, calyx less than $\frac{1}{10}$ in., densely matted, teeth 5, linear-bristle-like, nearly equal to the calyx tube petals, stamens and style

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

as above; pod $\frac{1}{4}$ - $\frac{3}{8}$ in., sessile expanded, densely velvety, straight, linear-oblong, 6-8 seeded.

Astragalus Aitchisoni,

LEGUMINOSÆ.

F. B. I. ii. 121.

Salt range (Aitchison).
Pindigheb.

Rawalpindi District
(Donie).

small, annual weed, slender, thinly covered with white hairs; leaves $1\frac{1}{2}$ - $2\frac{1}{2}$ in., distinctly stalked, stipules triangular, minute, leaflets 17-25, $\frac{1}{2}$ in., alternate, wide apart, grey green, a few short horizontal white hairs; flowers $\frac{1}{2}$ in., white with a purple tip, in a loose head of 4-6 flowers on a short stalk, bracts minute, calyx $\frac{1}{8}$ in., bell-shaped, thinly white silky, teeth 5, linear or lanceolate, petals 5, standard longer than the wings and keel, stamens and style as those in the last species; pod $1\frac{1}{2}$ in., slender, straight or slightly curved, slightly clothed with white hairs, 15-20-seeded, seeds very small.

Astragalus contortilicatus,

LEGUMINOSÆ.

F. B. I. ii. 122.

The Plains.

Baluchistan (Boissier.)

small, annual weed, covered with short, soft, spreading white hairs; leaves 3-4 in., distinctly stalked, stipules small, free, lanceolate, leaflets 13-17 oblong-lanceolate with a broad and notched tip. $\frac{1}{4}$ - $\frac{1}{2}$ in., wide apart, greenish, soft scattered hairs on both sides; flowers $\frac{1}{2}$ in., yellow in dense many-flowered heads on stalks, with few scattered soft hairs, much shorter than the leaves, calyx $\frac{1}{8}$ in., with a few scattered soft hairs, teeth 5, bristle-like, feathered, petals 5, projecting a little from the calyx, wings lanceolate, short-pointed, shorter than the standard and keel, stamens and style like those in the last species; pod $\frac{1}{2}$ in., cylindrical, much recurved, sausage-shaped, folded lengthwise, wrinkled, 20-30 seeded.

Astragalus meianostachys.

LEGUMINOSÆ.

F. B. I. ii. 125.

Himalaya, 10-15,000 ft.
Kashmir.
Lahoul.

medium size, perennial, fairly stout, smooth; leaves 1-3 in., distinctly stalked, stipules $\frac{1}{4}$ - $\frac{3}{8}$ in., leafy, free, triangular with a sharp hard point, leaflets 13-15, oblong, green with a bluish waxy gloss, blunt or notched; flowers $\frac{1}{2}$ - $\frac{1}{4}$ in., lilac or purple in crowded heads, 1-3 in. long, stalks 2-6 in., covered with

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

short spreading black and also white hairs, dense just below the head, calyx $\frac{1}{8}$ - $\frac{1}{5}$ in., covered with black silky hairs, teeth 5, equal to the tube, nearly sessile, petals 5, contracted, keel and wings shorter than the standard, stamens and style like those of the last species; pod $\frac{1}{8}$ in., oblong, sessile, black, silky, two-seeded.

- Astragalus cashmirensis**, small, perennial, stems stout, shaggy with long hairs; leaves 3-4 in., distinctly stalked, stipules $\frac{1}{2}$ in., lanceolate, thin, free, marked with lines, leaflets 29-33, oblong blunt, or short-pointed, $\frac{3}{8}$ - $\frac{1}{2}$ in., crowded, dull, densely clothed at first with fine long hairs; flowers $\frac{3}{4}$ in., yellow in dense round heads on stalks 1-3 in., bracts $\frac{1}{4}$ - $\frac{3}{8}$ in., linear, feathered, persistent, calyx $\frac{3}{8}$ - $\frac{1}{2}$ in., thinly covered with long hairs, teeth 5, linear, petals 5, standard longer than the wings and keel, stamens and style like those of the last species; pod $\frac{1}{2}$ in., linear-oblong, straight, sessile, finely velvety, hollowed down the keel, narrowed into a long beak, 6-8 seeded.
- Astragalus leucocephalus**, small, perennial, densely covered with silvery white hairs, stems slender short; leaves 1-3 in., stipules small, leaflike, united below the middle, leaflets $\frac{1}{3}$ - $\frac{1}{4}$ in., oblong, 21-31, thick, blunt or nearly short-pointed, close to each other, covered with silvery white hairs; flowers $\frac{1}{4}$ in., pale yellow in small very dense, oblong heads on densely white felted stalks, 2-6 in., bracts lanceolate, longer than the buds, calyx $\frac{1}{8}$ in., shaggy with white hairs, nearly sessile, teeth 5, bristle-like, equal to the calyx tube, petals 5, keel shorter than the standard and wings, stamens and style like those of the last species; pod $\frac{1}{8}$ in., oblong, sessile, finely downy, 3-4 seeded.

- Astragalus cashmirensis**,
LEGUMINOSÆ.
F. B. I. ii. 127.
Kashmir 9-10,000 ft.
(Falconer).
- Astragalus leucocephalus**,
LEGUMINOSÆ.
F. B. I. ii. 128.
Himalaya 1-7,000 ft.
Simla, Naldera
(Collett).
Murrée (Douie).
Sakesar, Salt range.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Astragalus Munroi.

LEGUMINOSÆ.

F. B. I. ii. 128.

Spiti, Lahul.

small, perennial, rootstock stout, long, woody, spindle-shaped, stems of a tuft of shoots from the base, stout, shaggy with dense spreading white hairs; leaves $1\frac{1}{2}$ -2 in., stipules $\frac{1}{2}$ in., linear or lanceolate, free, leaflets 19-21, $\frac{3}{4}$ -1 in., lanceolate with a broad blunt tip, thinly covered with loose white hairs; flowers $\frac{3}{4}$ - $\frac{7}{8}$ in., yellow, in few-flowered sessile axillary heads, calyx $\frac{1}{2}$ - $\frac{5}{8}$ in., thinly velvety, teeth 5, linear, bristle-like, petals 5, nearly equal, stamens and style like those of the last species; pods oblong, sessile 1 in. long, inflated, 10-12 seeded.

Oxytropis lapponica.

see Herbs, Unbranched, Alternate, Stipulate, Compound.

Oxytropis cachemirica,

LEGUMINOSÆ.

F. B. I. ii. 139.

Kashmir 8-10,000 ft.

small, perennial, rootstock woody, stem short finely velvety; leaves 1-2 in., stipules lanceolate or triangular, united below, leaflets 13-21, oblong lanceolate, $\frac{3}{8}$ - $\frac{1}{2}$ in., densely white silky; flowers $\frac{1}{2}$ in., yellow, rarely purple in dense heads, 12-30 flowered, on long stalks, bracts distinct, lanceolate, calyx $\frac{3}{8}$ in., densely white silky, teeth 5, linear, nearly equal, petals 5, standard longest, keel shortest with a distinct point, stamens 10, one free, others united, style abruptly incurved, beardless; pod $\frac{3}{8}$ - $\frac{5}{8}$ in., sessile, much inflated, shaggy with loose dense white silky hairs, round-oblong, 5-6 seeded.

Oxytropis Meinshausenii,

LEGUMINOSÆ.

F. B. I. ii. 139.

Himalaya 9-11,000 ft.
Valley of Kishengunga.

small, perennial, stem distinct, at first thinly covered with soft scattered hairs; leaves 3-4 in., stipules $\frac{1}{4}$ - $\frac{1}{2}$ in., free, lanceolate or oblong, leaflets 17-31, $\frac{1}{2}$ - $\frac{3}{4}$ in., oblong, blunt, green, slightly covered with long whitish hairs on both surfaces, flowers $\frac{3}{4}$ in., yellow, rarely purple in a dense 12-20 flowered head on erect stalks, 4-6 in., bracts $\frac{1}{3}$ - $\frac{1}{4}$ in., linear, covered with scattered black

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

hairs, calyx $\frac{3}{8}$ in., tubular, thinly covered with horizontal black hairs, teeth 5, linear, feathered in black, petals, stamens and style like those in the last species; pod $\frac{1}{4}$ - $\frac{2}{8}$ in. oblong, expanded, straight, short-stalked, with a few silky black hairs 6-8 seeded.

***Onobrychis Stewartii*.**

LEGUMINOSÆ.

F. B. I. ii. 141.

The Plains.

Hazara (Stewart).

Rawalpindi (Aitchison)

Kot Futteh Khan.

Rawalpindi District.

(Douie).

medium size, annual, stem slender, becoming smooth; leaves 3-4 in., including stalk, stipules linear, minute, leaflets 9-11, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, lanceolate with broad tip, nearly short-pointed, wide apart, somewhat hairy; flowers red, $\frac{1}{3}$ in., in long stalked axillary racemes, 6-9 in., bracts linear, minute; calyx $\frac{1}{12}$ in., bell-shaped, silky, teeth 5, lanceolate, petals 5, standard broad, smooth, veined, wings short, keel blunt, stamens 10, all united, style thread-like, incurved; pod $\frac{1}{6}$ - $\frac{1}{3}$ in., kidney-shaped, expanded, faces woody, deeply honey-combed, edge armed with close minute spines, one-seeded. Douie found the stipules larger than minute, and the stamens not all united.

***Hedysarum astragaloides*.**

LEGUMINOSÆ.

F. B. I. ii. 146.

Himalaya 11-12,000 ft.

Kishtwar (Thomson).

Lahul (Jaeschke).

medium size, stems robust, becoming grey velvety at first; leaves including the stalk, 4-8 in. long, leaflets 21-29, $\frac{3}{4}$ -1 in., linear-oblong, blunt with a minute point, smoothish above, persistently grey velvety beneath; flowers $\frac{3}{4}$ in., red in very dense racemes 2-3 in. long, bracts linear thin projecting beyond the buds, calyx $\frac{1}{4}$ in., bell-shaped, finely silky, teeth 5, petals 5, standard shorter than the keel, keel blunt, stamens 10, upper free, lower ones united, style thread-like, very long, abruptly bent; pod stalked, distinctly one or two-jointed, joints oblong, thin, with a crisped wing below, less marked one above.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Hedysarum oachemirianum.

LEGUMINOSÆ.

F. B. I. ii. 146.

Kashmir, 9-10,000 ft.

medium size, stem robust, smooth, grooved; leaves including the stalk 6-12 in. long, leaflets 21-27, $\frac{3}{4}$ -1 $\frac{1}{4}$ in., long, linear-oblong, thin, blunt, both sides green, becoming smooth; flowers $\frac{3}{4}$ -1 in., red in very dense racemes, 2-3 in., bracts linear, bristle-like, longer than the buds, calyx $\frac{3}{8}$ in., downy, teeth 5, petals 5, stamens and style as in the last species; pod of 1 to 3 joints, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, oblong, smooth, both sutures with a distinct uncrisp wing.

Hedysarum laxiflorum.

LEGUMINOSÆ.

F. B. I. ii. 146.

Himalaya, 9-12,000 ft.
Valley of Kishengunga
(Winterbottom).

medium size, stems slender, firm, smooth; leaves including stalk, 3-5 in., leaflets 21-31, linear oblong, close, firm, nearly leathery, smooth above, grey, barely covered with grey velvet beneath; flowers $\frac{5}{8}$ - $\frac{3}{4}$ in., red in loose racemes, 2-3 in., bracts minute bristle-like, calyx $\frac{1}{6}$ in., teeth 5, upper triangular, lower lanceolate, pod 3-4 jointed oblong, firm, smooth, rather expanded, not more than $\frac{1}{6}$ in. long; otherwise like the last species.

Hedysarum strobiliferum.

LEGUMINOSÆ.

F. B. I. ii. 146.

Kashmir, 9,000 feet
(Falconer).

small, stem robust, thickly covered with short horizontal whitish hairs; leaves including the stalk, 6-8 in., leaflets 19-25, oblong-lanceolate, 1-1 $\frac{1}{2}$ in., blunt, smoothish above, somewhat white-silky beneath; flowers less than $\frac{1}{2}$ in., yellowish, in dense racemes, 2-3 in., bracts overlapping, thin, dry, stiff, bristly quite hiding the buds, calyx $\frac{1}{5}$ - $\frac{1}{4}$ in., tubular, teeth 5, short, triangular with sharp hard points petals 5, equal; stamens and style as in the last species.

Hedysarum microcalyx.

LEGUMINOSÆ.

F. B. I. ii. 147.

Himalaya, 9,000 ft.
Kashmir.
Lahul.

medium-size, stems stout, smooth, furrowed, leaves including the stalk, 6-9 in., leaflets 11-13, oblong-lanceolate, 1-1 $\frac{1}{2}$ in., wide apart, blunt, both sides green, smooth; flowers $\frac{5}{8}$ - $\frac{3}{4}$, bright red, in loose racemes, 2-4 in., calyx $\frac{1}{8}$ in., bell-shaped, smooth, thin, teeth 5, minute, triangular with a

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

hard sharp point, petals 5, keel longer than standard, stamens and style as in the last species; pod 2-3 jointed, $\frac{1}{2}$ - $\frac{5}{8}$ in., oblong, thin, smooth, both sutures distinctly margined.

Smithia sensitiva,
Oda-brini.

LEGUMINOSÆ.

F. B. I. ii. 148.

The Plains.

medium-size, annual, stems very slender, not bristly, much branched; leaves including stalk $\frac{1}{2}$ -1 in., midrib bristly, stipules thin, dry with processes at the base, leaflets 4-20, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, sensitive, oblong, blunt, bristly on the midrib beneath and along the almost straight margins; flowers $\frac{3}{5}$ in., yellow, 1-6 in short stalked axillary racemes, calyx $\frac{1}{4}$ - $\frac{1}{3}$ in., 2-lipped, lips entire, short-pointed, with a few scattered pale yellow bristles, petals 5, standard circular, keel incurved, blunt, stamens 10, in two bundles of five, style thread-like, incurved; pod of 4-6 joints, joints covered with minute nipple-like projections, folded together inside the calyx. This plant is eaten as a potherb, and forms a useful fodder.

Smithia geminiflora,

LEGUMINOSÆ.

F. B. I. ii. 149.

Himalaya, 1-3,000 ft.

very like the last species, but with fewer leaflets, more bristles on the midribs and margins of leaflets, and the flowers in pairs in the axils of leaves.

Smithia ciliata,

LEGUMINOSÆ.

F. B. I. ii. 150.

Himalaya, 3-6,000 ft.

Simla, Naldera

(Collett).

small to medium-size, annual, stem slender, not bristly; flowers in dense shortly stalked one-sided axillary racemes, bracteoles leafy, oblong with scattered bristles, calyx upper lip sharply cut off, lower lanceolate; otherwise like the two last species.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Æschynomene indica*,Kath-sola.*

LEGUMINOSÆ.

F. B. I. ii. 151.

The Plains to 5,000 ft.
Kashmir.Valleys below Simla
(Collett).Phalia, Gujrat District
(Douie).

large, annual, pale green, stem smooth, branches many, cylindrical, often slightly rough with tubercles; leaves 2-3 in., stalk sticky with glands, stipules linear-lanceolate, long-pointed, with processes at the base, soon falling off, leaflets 41-61, sensitive, very small, upper ones smallest, overlapping, alternate, narrowly oblong, rounded with a small point; flowers $\frac{1}{2}$ in., yellow, often with purple streaks, in many, sticky, axillary racemes, bracts small, lanceolate, fringed with hairs, calyx $\frac{1}{2}$ in., smooth, deeply 2-lipped, lips faintly toothed, petals 5, standard circular, erect, keel nearly straight, blunt, stamens 10 in two bundles of five, style incurved, smooth; pod $1-1\frac{1}{2}$ in. long, linear, stalked, flattened, smooth, straight or rather curved, upper suture straight, lower indented, joints 6-10, smooth or finally rough with nipple-like processes, one seed in each joint. The allied species *Æ. aspera*, yields the pith (sola) from which sun hats are made.

Uraria picta*,Dabra, deter.*

LEGUMINOSÆ.

F. B. II. ii. 155.

The Plains to 6,000 ft.

large, perennial, stem finely downy, robust, branches few; leaves 10-12 in. long, lowest simple or of 3 leaflets, rounded or oblong, upper of 5-9 leaflets, mid stalk downy, stipules $\frac{1}{2}$ in., lanceolate, long-pointed, leaflets 4-8 in., linear-lanceolate, leathery, smooth, clouded with white above, net veined, minutely velvety beneath; flowers purple $\frac{1}{4}$ in., in dense cylindrical racemes, 6-12 by $\frac{5}{8}-\frac{3}{4}$ in., bracts brown, thin, soon falling off, minor flower stalks bristly, abruptly incurved, after flowering, at the tip, calyx $\frac{1}{2}$ in., tube very short, teeth 5, 2 upper short, lower long, bristle-like, petals 5, standard broad, wings united to the keel, stamens 10, upper one free, lower ones united, style thread-like, sharply bent; pod of 3-6 joints, joints small, swollen, one-seeded, polished, often placed face to face. The seeds are used to cure ulcerated mouths.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Cicer arietinum,
Gram or Chick-pea,
Chana.

LEGUMINOSÆ.

F. B. I. ii. 176.

The Plains to 2,000 ft.

Commonly cultivated.

small, annual, sticky, much branched; leaves 1-2 in., stipules small, obliquely ovate, with a few long teeth, strongly veined, leaflets 13 or so, $\frac{1}{4}$ in. long, ovate or oblong, deeply cut, strongly veined, flowers $\frac{3}{8}$ in., pink, blue or white, solitary axillary on stalks $\frac{1}{2}$ - $\frac{3}{4}$ in., calyx $\frac{1}{4}$ - $\frac{1}{3}$ in., teeth 5, linear, nearly equal, petals 5, standard broad, longer than the wings and keel, stamens 10, upper free, lower united, style incurved, beardless; pod $\frac{3}{4}$ -1 in., swollen, velvety, sessile, narrowed into the persistent style, seeds 2 nearly round, reddish brown, black or white, indented, beaked.

Vicia tetrasperma,

LEGUMINOSÆ.

F. B. I. ii. 177.

Himalaya 6-8,000 ft.

medium size, annual, stem smooth, very slender much branched; leaves $\frac{1}{2}$ -1 in., ending in twisted tendrils, stipules large, pointed, often toothed, base ending in a pointed lobe, leaflets 6-12, narrowly oblong, $\frac{1}{3}$ - $\frac{3}{4}$ in., blunt or short pointed; flowers $\frac{1}{4}$ in., pale blue, in pairs or rarely solitary on axillary stalks equal in length to the leaves, calyx $\frac{1}{2}$ in., bell-shaped, teeth 5, three lower the longest, petals 5, longer than the calyx, standard broad, erect, keel nearly straight, blunt, shorter than the wing petals, stamens 10, upper one nearly or quite free, others united, style short, incurved, velvety all round; pod $\frac{1}{2}$ in., smooth, oblong, seeds 3 or 4.

Vicia Griffithii,

LEGUMINOSÆ.

F. B. I. ii. 178.

The Plains.

Rawalpindi.

Futtehjang (Aitchi-
 son).

Baluchistan (Duthie).

medium-size, perennial, stems slender, finely silky, thin, smooth, straggling; leaves 2 in., ending in twisted tendrils, stipules triangular, deeply cut, leaflets 12-16, $\frac{1}{8}$ - $\frac{1}{4}$ in., wide apart, linear-oblong, thin, blunt; flowers $\frac{5}{8}$ in., lilac in 2-4 flowered, axillary racemes, as long as the leaves, calyx $\frac{1}{6}$ in., rather silky, teeth 5, upper triangular, lower lanceolate, pod $1\frac{1}{4}$ in., oblong, flat, smooth, veined, seeds 5-6; otherwise like the last species.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Vicia sativa.

Vetch. or Tare.

LEGUMINOSÆ.

F. B. I. ii. 178.

The Plains to 7,000 ft.

small to medium size, annual, stems slender spreading or erect, rather downy; leaves pinnate ending in twisted tendrils, stipules small, obliquely lanceolate, deeply toothed, leaflets 8-12, those of upper leaves $\frac{1}{2}$ -1 in. strap shaped, of lower shorter, broader, sometimes deeply notched at the apex; flowers $\frac{3}{8}$ in. or less, red-blue usually solitary, rarely in pairs, axillary, sessile, calyx $\frac{3}{8}$ in., teeth 5, lanceolate-awlshaped, petals 5, twice the length of the calyx, style bearded below the stigma, pod 1-2 in., smooth, seeds 8-10; otherwise like the last species. A weed of cultivation, stated to be sometimes cultivated as a fodder plant.

Vicia peregrina.

LEGUMINOSÆ.

F. B. I. ii.

The Plains.

small, annual, slender, smooth, spreading, leaflets 10-12, alternate or opposite, $\frac{1}{2}$ -1 in. long, stipules minute, bifid with linear divisions; flowers $\frac{1}{2}$ in. red purple solitary, on short axillary stalks, calyx $\frac{1}{4}$ in., teeth lanceolate, upper shorter curved upwards; pods 1-1 $\frac{1}{4}$ in., linear-oblong, abruptly turned down, smooth, rather curved, seeds 5-6; otherwise like the last species.

Vicia sepium.

LEGUMINOSÆ.

F. B. I. ii. 179.

Kashmir.

medium-size, perennial, finely downy; leaflets oblong, abruptly ended, stipules small, deeply toothed, flowers $\frac{2}{3}$ in., reddish in 2-6 flowered, nearly sessile, one-sided, racemes only in the axils of upper leaves, calyx $\frac{1}{3}$ in., smooth or downy, teeth triangular with a sharp hard point, pod 1 in., oblique, smooth, beaked, seeds 6-10; otherwise like the last species.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

Vicia narbonensis.

LEGUMINOSÆ.

F. B. I. ii. 179.

Peshawar (Vicary)

The Park at Rawalpindi.

medium-size, annual, stout, smooth or finely downy; leaflets 2 on the lowest leaves, 4-6 on the upper, 1-2 in. long, entire, obovate, stipules large, deeply cut; flowers $\frac{7}{8}$ in., purple and white, in nearly sessile 2-6 flowered racemes, calyx $\frac{3}{8}$ in., upper teeth triangular, lower lanceolate; pod $1\frac{1}{2}$ -2 in., downy, 6-7 seeded; otherwise like the last species.

Vicia Faba.**Broad bean.***Bakla, chastang.*

LEGUMINOSÆ.

F. B. I. ii. 179.

The Plains to 8,000 ft.

very like the last species, but larger. It is cultivated widely as a vegetable, and possibly may have once originated from *Vicia narbonensis*.

Lens esculenta.**Lentil.***Masur dal.*

LEGUMINOSÆ.

F. B. I. ii. 179.

The Plains.

Baluchistan (Hughes-Buller.)

small, annual, softly velvety, branching from the base; leaves terminating in a bristle, stipules almost lobed at the base, leaflets 8-12, entire, lanceolate, often tipped with a small sharp point, sessile; flowers pale purple in 2-4 flowered racemes on stalks equal to the leaves, the end of the stalk extending beyond the flowers, calyx teeth linear, silky, petals 5, standard broad, wings joined to the keel, keel shorter than the wings, stamens 10, united into a tube with an oblique mouth, style abruptly bent, bearded on its inner face; pod $\frac{1}{2}$ in., long, oblong, flattened, smooth, seeds 2, grey with minute spots, flattened.

Lathyrus altaicus.

LEGUMINOSÆ.

F. B. I. ii. 180.

Himalaya 6-8,000 ft.

Chenab Valley (Royle.)

small, perennial, glabrous; leaves 2-3 in., terminated by a long tendril, stipules lanceolate with a tail-like point, slightly toothed, leaflets 6-8, $\frac{1}{2}$ - $\frac{3}{4}$ in., broad, oblong, thin, with a bluish waxy gloss; flowers reddish, $\frac{3}{4}$ in., in 3-6-flowered loose one-sided racemes on stalks, 2-4 in. long, calyx $\frac{3}{8}$ in., 5-toothed, upper teeth triangular, lower linear,

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS DISSIMILAR.

petals 5, standard broad, keel shorter than the wings, stamens 10, upper free, others united, style flattened, bearded on the inner side, pod cylindrical or flattish.

Lathyrus luteus,
LEGUMINOSÆ.
F. B. I. ii. 180.
Himalaya.
8-10,000 ft.
Mashobra.
Mahasu, Matiana.
Huttu (Collett).
Salt range.

medium-size, perennial, smooth; leaves 3-5 in., ending in a bristle, stipules large, leafy, base 2-lobed, leaflets 6-8, 2-4 in. long, thin, short-pointed, pale green; flowers 1 in., yellow, in 6-12-flowered stalked racemes, equal to or longer than the leaves, calyx $\frac{3}{8}$ - $\frac{1}{2}$ in., teeth 5, upper triangular, lower lanceolate, pod 2-3 in., linear, beaked, seeds many; otherwise like the last species.

Phaseolus mungo,

see Prostrate Herbs, Alternate, Stipulate, Compound.

Phaseolus calcaratus,

see Prostrate Herbs, Alternate, Stipulate, Compound.

PETALS SIMILAR.

Cassia occidentalis,

see Shrubs, Erect, Alternate, Stipulate, Compound.

Cassia Sophera,

see Shrubs, Erect, Alternate, Stipulate, Compound.

Cassia Tora or obtusifolia,
Pamcar.

LEGUMINOSÆ.
F. B. I. ii. 263.
The Plains to 5,000 ft.
Naldera.
Sutlej Valley (Collett)
Kangra Valley.

large, annual, shrub-like, not foetid; leaves 2-4 in., stalked, stipules $\frac{3}{4}$ in., linear, soon falling off, main leaf-stalk grooved, conical gland between the lowest pair of leaflets, leaflets 6, 1-2 in. long, oblong-ovate with a broad triangular tip, obliquely rounded at the base, thin, green, smooth or rather velvety on both surfaces; flowers $\frac{1}{2}$ in. long, bright yellow in nearly sessile axillary pairs, calyx divided into 5 nearly to the base, lobes green, petals 5, nearly equal, stamens 10, 7 perfect, 3 minute,

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

abortive, style incurved; pod 8-10 in., nearly cylindrical, divided by oblique partitions, sutures broad, seeds 30-35, flattened, brown shining. The leaves, seeds and root are used medicinally. It is a very common weed which flowers during the rains.

Cassia obovata or obtusa,
Indian Senna.

LEGUMINOSÆ.

F. B. I. ii. 264.

The Plains.

Delhi, Salt Range.

Derajat.

Baluchistan (Boissier).

medium-size, annual or perennial, nearly smooth, branches angular; leaves 2-3 in., stalked, no gland between the leaflets, stipules lanceolate, persistent leaflets 8-12, $\frac{1}{3}$ - $1\frac{1}{3}$ in. long, oblong-ovate with a broad tip, rounded with a minute point, thin, a waxy bluish gloss beneath; flowers $\frac{3}{4}$ in., pale yellow in narrow few-flowered stalked racemes, 2-3 in., calyx segments blunt, smooth, stamens very unequal, pods $1-1\frac{1}{2}$ in. long, shortly stalked, much curved; rounded at the ends, flexible smooth, seeds 6-12, separated by very thin partitions: otherwise like the last species.

Cassia absus.

Chaksu.

LEGUMINOSÆ.

F. B. I. ii. 265.

The Plains to 5,000 ft.

Valleys below Simla

(Collett).

Dharmpur.

medium-size, annual or biennial, covered with grey sticky hairs; leaves $1\frac{1}{2}$ -3 in., long-stalked, a small gland on the main stalk between every pair of leaflets, stipules small, linear, persistent, short-pointed, leaflets 4, 1-2 in. long, oblong, blunt or nearly short-pointed, unequal at the base, hairy beneath as well as above; flowers $\frac{1}{4}$ in. diam., red-yellow in few flowered erect narrow short racemes, calyx of 5 narrow segments, $\frac{1}{8}$ - $\frac{1}{5}$ in. long, lanceolate, bristly, petals 5, nearly equal with long stalks, veined, stamens 5, equal, perfect; pod $1-1\frac{1}{2}$ in., trap-shaped, oblique, seeds 5, flattened, dark-brown, shining.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

Spiræa aruncus,
Meadow sweet.

ROSACEÆ.

F. B. I. ii. 323.

Himalaya, 8-10,000 ft.

Hattu (Collett).

large, perennial rootstock, shrub-like, smoothish; leaves 6-12 in., 2 to 3-pinnate, long primary and secondary leaf-stalks, leaflet-stalks short, stipules rudimentary, leaflets usually in threes, 1-3 in. long, ovate, sharply and irregularly toothed, narrowed into a tail-like tip; flowers $\frac{1}{6}$ - $\frac{1}{4}$ in., many, white, one sexual, male and female on different plants, in long slender velvety branching racemes, calyx persistent, lobes 5, oblong, ovate, petals 5, orbicular, stamens 20 or more, sometimes united below, styles 5 or more, nearly terminal; follicles 6 or more, swollen, smooth, shining, seeds few. This plant is often mistaken for *Astilbe rivularis*, but the latter has no petals.

la albifolia,

ROSACEÆ.

F. B. I. ii. 347.

Himalaya, 8-10,000 ft.

Hattu, Bhagi (Collett).

small, perennial, rootstock stout, stems several, slender, zigzag, velvety, branched; leaves 2-4 in., pinnate, stalk very slender, stipules $\frac{1}{3}$ - $\frac{3}{4}$ in., sheathing, loose, brown, short-pointed, united for half their length to the stalk, leaflets 5-9, $\frac{1}{4}$ -1 in., ovate, deeply and sharply toothed, lateral leaflets diminishing from the uppermost pair downwards, green, velvety above, white-felted beneath; flowers $\frac{1}{4}$ in. diam., yellow, solitary on slender axillary stalks, 1-2 in., calyx persistent, tube shallow with 5 lobes, alternating with 5 bracteoles, white-felted, lobes triangular, bracteoles linear-oblong, petals 5, oblong, shorter than the calyx lobes, stamens 5, styles many, achenes many forming a head, hairy, covered by the calyx lobes, large, deeply furrowed, receptacle felted.

Potentilla fulgens,

ROSACEÆ.

F. B. I. ii. 165.

Himalaya, 6-9,000 ft.

Simla.

Mashobra (Collett).

small, perennial, rootstock stout, stem leafy, softly silky; leaves 2-8 in., pinnate, stalk stout, lower stipules dry, thin, upper leafy, toothed or lobed, leaflets many, in large and small pairs alternately, decreasing in size from above downwards, ovate, sharply toothed, terminal leaflet 1-1 $\frac{1}{2}$ in.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

green, hairy above, silvery felted beneath; flowers $\frac{1}{2}$ in. diam., yellow crowded in terminal clusters or branched racemes, bracteoles quite entire or 2-3-fid, calyx silvery hairy, lobes ovate, short-pointed, petals orbicular, ovate with a broad tip, stamens many, styles short, slender, ventral, achenes small, smooth; otherwise like the last species.

Potentilla Clarkei.

ROSACEÆ.

F. B. I. ii. 351.

Himalaya 7,000 ft.

Srinagar.

Kashmir (Clarke).

small, perennial, rootstock woody, stem stout, ascending, leafy, rough with long spreading hairs; leaves 1-2 in., covered with spreading hairs, stipules on the stem, leafy, large, half ovate, entire or toothed, leaflets $\frac{1}{2}$ -1 in., 5-7, ovate with a broad tip, very coarsely round-toothed, $\frac{1}{3}$ way down, sessile, close together; flowers $\frac{1}{2}$ in. diam., yellow stalked, very stiff in clusters with very spreading leafy branches and bracts; calyx lobes short-pointed, petals ovate with a broad tip, stamens many, styles slender, terminal, achenes many, large minutely wrinkled on a raised hairy receptacle; otherwise like the last species.

Potentilla sericea.

ROSACEÆ.

F. B. I. ii. 354.

Himalaya 9-17,000 ft.

Kashmir.

small to medium-size according to elevation, rootstock erect, very stout, stems many, white, densely silky-felted; leaves 1-6 in., crowded about 1 in. broad, leaflets 5-11, oblong, silky on both surfaces, all cut nearly to the midrib, terminal leaflets radiating, lateral, opposite and alternate; flowers $\frac{1}{4}$ - $\frac{3}{4}$ in. diam., yellow on flowering stems, densely felted, in many or few flowered clusters or solitary, calyx lobes triangular-ovate or lanceolate bracteoles narrowly oblong, blunt, petals orbicular, ovate with a broad tip, styles terminal, achenes many, smooth; otherwise like the last species.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

Potentilla nepalensis,*Rattan jot,*

ROSACEÆ.

F. B. I. ii. 355.

Himalaya, 5-9,000 ft.

Simla (Collett).

Murree.

medium-size, perennial, stout or slender, softly hairy to nearly smooth, stem branched, leafy; leaves digitately compound, radical 12 by 3 in., long-stalked, leaflets 5, 1-3 by $\frac{1}{4}$ - $1\frac{1}{4}$ in., sessile, stem stipules $\frac{3}{4}$ -1 in., ovate or oblong, lower entire, upper lobed, leaflets ovate with a broad tip or rounded, coarsely toothed, green; flowers $\frac{3}{8}$ -1 in. diam., purple, stalked in forked branching racemes, calyx lobes short-pointed, bracteoles blunt, petals reversed heart-shaped, longer than the calyx lobes, achenes very many, minute, wrinkled on a round hairy receptacle; otherwise like the last species.

Potentilla kashmirica,

ROSACEÆ.

F. B. I. ii. 355.

Kashmir, 7,500 ft.

Nowgunge (Clarke).

very like the last species, but with shorter leaf stalks, shorter more deeply toothed leaflets, yellow flowers, more deeply wrinkled achenes, and broadly clustered flowers.

Potentilla argentea,

see Herbs, Unbranched, Alternate, Stipulate, Compound.

Agrimonia eupatorium,

see Herbs, Unbranched, Alternate, Stipulate, Compound.

Agrimonia pilosa,

see Herbs, Unbranched, Alternate, Stipulate, Compound.

FLOWERS, MINUTE, IN UMBELS.

Vicatia conifolia,

see Herbs, Erect, Alternate, Exstipulate, Compound.

Vicatia millefolia,

see Herbs, Erect, Alternate, Exstipulate, Compound.

Elaeosticta meifolia,

see Herbs, Erect, Alternate, Exstipulate, Compound.

Apium graveolens,

see Herbs, Erect, Alternate, Exstipulate, Compound.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

FLOWERS, MINUTE, IN UMBELS.

- Cicuta virosa**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Carum Carui**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Carum Bulbocastanum**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Carum Roxburghianum**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Carum copticum**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Sium latijugum**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Pimpinella saxifraga**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Pimpinella acuminata**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Pimpinella diversifolia**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Osmorrhiza claytoni**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Chærophyllum virosum**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Chærophyllum reflexum**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Chærophyllum capnoides**, see Herbs, Erect, Alternate, Exstipulate, Compound.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

FLOWERS, MINUTE, IN UMBELS.

Chærophyllum cachemiricum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Scandix Pecten-Veneris,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Anthriscus nemerosa,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Seseli sibiricum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Pycnocycla glauca,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Fœniculum vulgare,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Prangos pabularia,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Ligusticum marginatum.	see Herbs, Erect, Alternate, Exstipulate, Compound.
Selinum tenuifolium.	see Herbs, Erect, Alternate, Exstipulate, Compound.
Selinum papyraceum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Selinum Candolii,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Selinum vaginatum,	see Herbs, Erect, Alternate, Exstipulate, Compound.
Pleurospermum Govianum,	see Herbs, Erect, Alternate, Exstipulate, Compound.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS SIMILAR.

FLOWERS, MINUTE, IN UMBELS.

- Pleuropermum Candolii**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Pleuropermum angelicoides**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Pleuropermum stylosum**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Pleuropermum densiflorum**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Pleuropermum Brunonis**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Angelica glauca**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Archangelica officinalis**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Ferula Thomsoni**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Ferula Jäschkeana**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Peucedanum graveolens**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Peucedanum Thomsoni**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Heracleum Thomsoni**, see Herbs, Erect, Alternate, Exstipulate, Compound.
- Heracleum pinnatum**, see Herbs, Erect, Alternate, Exstipulate, Compound.

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES,

LEAFLETS MANY.

PETALS SIMILAR.

FLOWERS, MINUTE, IN UMBELS.

- | | |
|----------------------------------|---|
| Heracleum cachemiricum, | see Herbs, Erect, Alternate, Exstipulate, Compound. |
| Heracleum canescens, | see Herbs, Erect, Alternate, Exstipulate, Compound. |
| Heracleum candicans, | see Herbs, Erect, Alternate, Exstipulate, Compound. |
| Zosimia absinthifolia, | see Herbs, Erect, Alternate, Exstipulate, Compound. |
| Coriandrum sativum, | see Herbs, Erect, Alternate, Exstipulate, Compound. |
| Cuminum Cyminum, | see Herbs, Erect, Alternate, Exstipulate, Compound. |
| Daucus Carota, | see Herbs, Erect, Alternate, Exstipulate, Compound. |
| Caucalis Anthriscus, | see Herbs, Erect, Alternate, Exstipulate, Compound. |
| Caucalis leptophylla, | see Herbs, Erect, Alternate, Exstipulate, Compound. |
| Caucalis latifolia, | see Herbs, Erect, Alternate, Exstipulate, Compound. |
| Psammodictyon biternatum, | see Herbs, Erect, Alternate, Exstipulate, Compound. |

PETALS NONE.

- | | |
|------------------------------|---|
| Thalictrum cultratum, | see Herbs, Erect, Alternate, Exstipulate, Compound. |
|------------------------------|---|

HERBS, ERECT, WITH ALTERNATE STIPULATE COMPOUND LEAVES.

LEAFLETS MANY.

PETALS NONE.

Thalictrum reniforme, see Herbs, Erect, Alternate Exstipulate, Compound.

Thalictrum Javanicum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Thalictrum foliolosum, see Herbs, Erect, Alternate, Exstipulate, Compound.

Astilbe rivularis, large, rootstock perennial, hairy ; leaves 6-18 in.,
 SAXIFRAGACEÆ. irregularly 2-pinnate, stipules large, thin, united to
 F. B. I. ii. 389. the leaf stalk, sheathing, base of leaf stalk enlarged,
 Himalaya, 4-9,000 ft. hairy, leaflets 1-4 in., ovate, sometimes lobed, heart-
 Simla, Mashobra (Col- shaped at the base, sharply toothed, long-pointed,
 lett). smooth above, minutely bristly beneath along the
 Kashmir. midrib and nerves ; flowers very small, greenish-
 Dalhousie. yellow, sometimes one sexual in spicate racemes,
 forming a large terminal branching raceme, 12-24
 in. long, stalk of raceme softly hairy, calyx bell-
 shaped, united to the base of the ovary, lobes 5,
 deeply divided, persistent, petals none, stamens 5,
 opposite the sepals, styles 2; capsule small 2 beaked,
 seeds minute, many, narrow tailed at both ends,
 sometimes mistaken for *Spiræa Aruncus*, whose fruit
 has 3-4 beaks.

(To be continued.)

PROGRESS OF THE MAMMAL SURVEY.

When the last account was written in March 1912 (p. 640 of the last Journal) Mr. Crump was commencing to collect in Hoshangabad. From there he proceeded to Pachmarhi for a short spell and then to Saugor, Damoh, Balaghat and Chanda, all in the Central Provinces. He was unable to stay long in each district but managed to obtain some 519 specimens by the 12th July.

As the rains will probably set in by the latter part of June, it is proposed to bring Mr. Crump back then and a little later to send him to Sind where the rainfall is light and collecting of mammals will be practicable.

Mr. D. O. Witt, I.F.S., kindly rendered much valuable aid to Mr. Crump in the Saugor District and to Mr. Chevenix Trench, I.C.S., the thanks of the Society are also due to Mr. F. J. Langhorne, I.F.S., for the assistance rendered in the Damoh District and to Mr. C. G. Leftwich, I.C.S., in the Chanda District.

Mr. Shortridge has been steadily collecting in Kanara and has stayed at the following centres Samasgi, Sirsi, Hulekal, Jog, Gersoppa and Honawar from whence he has sent some 506 specimens up to June 4th.

He is now near Shimoga (Mysore territory) having completed Kanara and his proceeding towards Mysore and then to the Eastward and it is proposed as soon as the worst of the rains are over that he should proceed to Coorg, the Shevaroyes, Nilgiris, Anamallays and Palneys where excellent results may be hoped for—but such a programme must, of course, take a very considerable time.

It will be noticed that the subscription list has made but little progress since the last list was published. The most satisfactory feature about it is the promised contribution from the Government of Madras who have kindly offered a grant of Rs. 2,500 towards the Survey. This grant is greatly appreciated and it is earnestly hoped that other Governments will follow this excellent example, particularly since the work which we are endeavouring to do is for the whole of India, Burma and Ceylon. It is also Imperial since we are giving specimens to the Imperial collection at the British Museum, South Kensington.

So far we have spent about Rs. 13,000 or roughly half the amount collected, and therefore if the work is to be completed a large amount of money has yet to be obtained.

MAMMAL FUND.

FURTHER LIST OF SUBSCRIBERS UP TO 31st MAY 1912.

NAME.	Amount.		
	Rs.	A.	P.
Amount previously acknowledged in Journal			
No. 2, Vol. XXI	26,398	5	0
Andrews, G. P.	16	0	0
Bagshawe, L. V.	15	0	0
Blunt, H. R.	10	0	0
Bowen, J. C. G.	30	0	0
Burnett, Prof. K.	7	8	0
Cadell, P. R.	30	0	0
Coode, J. M.	15	0	0
Delme-Radcliffe, Lt.-Col. H.	15	0	0
Forsyth, Dr. Wm.	5	8	0
Gaye, W. C. (2nd Donation)	10	0	0
Gordon, R. G.	50	0	0
Gray, Chas.	25	0	0
Hannington, F.	15	2	0
Henderson, Dr. J. R.	25	0	0
Hyam, Judah	10	0	0
Jamkhandi, H. H. The Chief	100	0	0
Laurence, T. R.	15	0	0
Manners Smith, Lt.-Col. J.	15	0	0
Muspratt, Lt.-Col. F. C.	30	0	0
Royal Society, The £25 ..	372	12	0
Stables, Major A.	15	12	0
Suter, Dr. M. F. (Rs. 10 per month-March, April and May)	30	0	0
Total ..	27,255	15	0
Promised by the Government of Madras, Rs. 2,500.			

MISCELLANEOUS NOTES.

No. I.—NOTES ON TIGERS.

With reference to Mr. Pitman's note under the above heading (Vol. XXI, No. 2, page 657) I would draw attention to Capt. Forsyth's remarks in "the Highlands of Central India," pp. 267, *et seq.*, 1899 edition. He states that regular cattle-lifters are known to natives as "*oontia bagh*" from his faintly striped coat resembling the colour of a camel. The author's explanation is that cattle-lifters are usually larger, older, and heavier animals than game killers and have taken to a cattle diet owing to a decreasing activity with advancing age. He wrote: "The larger and older the animal, the more yellow his coat becomes and the fainter and further apart are the stripes."

COIMBATORE, 16th May 1912.

C. E. C. FISCHER, I.F.S.

In the last issue of the Journal Mr. Pitman contributes two letters about tiger in the C. P. His experience of three cubs to the litter is unusual. I have shot and seen shot 8 or 10 tigresses, and I have not found more than two cubs carried. I have recently come across a tigress running with three cubs, one of which I shot. It was about three years old but the other two appeared to be a year old. As regards colouration in the hot weather Mr. Pitman's experience agrees with mine. The regular cattle killer is a fat beast, and his colour in the hot weather is very pale. The tiger who lives chiefly on game in the interior of forests is a much harder animal and keeps his colour even in the summer months. It is probably not a matter of protective colouring for the tiger in the daylight is always very conspicuous, his colour being obviously intended for the twilight. The darker colour of the tiger that does not live on cattle is probably due to his greater fitness.

BALAGHAT, C.P., 4th May 1912.

F. DEWAR, I.C.S.

Mr. Pitman refers to the number of cubs in the tigress's litter in your issue of the 31st March last. I believe that four is not an unusual number to be found in the foetus stage, but my experience goes to show that tigresses are seldom accompanied by more than two cubs, which points to the probability of not more than that number surviving.

As regards colouration of tigers, the differences noted by Mr. Pitman are probably due principally to age. At the same time animals inhabiting dense jungle are likely to be darker coloured than those of more open localities.

As tigers grow in age and weight, they are probably more addicted to cattle killing than game killing; it is an easier occupation. Old tigers lose

their brilliant colouring, and are sometimes quite faded, both as to the fulvous ground colouring and the stripes.

R. G. BURTON, LIEUT.-COLONEL,
94th Russell's Infantry.

CAMP, 23rd April 1912.

[The Raja Sahab of Mudhol (Kolhapur) has lately presented to the Society the skins of 4 tiger cubs which he said were cut out of a tigress shot in N. Kanara this hot weather.—EDS.]

During the Viceroy's shoot at Moband (Siwaliks) last week a tigress 8 foot 9 inches was shot. Out of her were cut six fully formed cubs, 2 males and 4 females. Would you be so good as to inform me if you have ever heard of six being found before and if it is a rare occurrence?

V. A. S. KEIGHLEY, CAPT.,
Viceroy's Bodyguard.

DEHRA DUN, 30th April 1912.

[We have not heard before of more than five cubs being found in a tiger's litter.—EDS.]

No. II.—NOTES ON PANTHERS.

Remarks regarding ten panthers whose skulls are presented to the Society, all recently shot in Buldana District, Berar.

Date on which skull shot marked.	Sex.	Length of panther in straight line.		General Remarks.
		Head and body.	Tail.	
31-3-12	Female.	3 ft. 8 in.	2 ft. 6 in.	Fully mature, as evident from teeth. Bright smooth coat; skull ridged; the rosettes about the centre of this animal's back have many central spots, as in the jaguar, a peculiarity I have not observed in others of the species, although there are occasionally two or three such spots.
6-4-12	Male.	3 ft. 6 in.	2 ft. 8 in.	Immature. Rough, fulvous coat. No occipital ridge.
10-4-12	Male.	4 ft. 3 in.	2 ft. 9 in.	Old; bright, smooth skinning coat, skull ridged and elongated.
15-4-12	Female.	3 ft. 3 in.	2 ft. 5 in.	Immature, but living by itself. Rough coat. No occipital ridge.

16-4-12	Female.	3 ft. 7 in.	2 ft. 7 in.	Old and has had young. Bright smooth coat; ridged skull.
19-4-12	Female.	3 ft. 4 in.	2 ft. 6 in.	Young; has not borne young. Dull, rough coat. No occipital ridge.
21-4-12	Female.	3 ft. 6 in.	2 ft. 5 in.	Young, as evident from teeth. Thickly spotted, dark rough fur. No occipital ridge.
23-4-12	Male.	4 ft. 2 in.	2 ft. 6 in.	Old. Very smooth, bright, shining coat. Ridged skull.
25-4-12	Female.	3 ft. 8 in.	2 ft. 6 in.	Mature. Appears to have had young. Pale colour, coat smooth. Ridged skull.
15-5-12	Male.	4 ft. 6 in.	2 ft. 9 in.	Very old. Dark colour, smooth coat. Ridged skull. This panther had a peculiar malformation of the tongue which was split in two for about four inches from the point.

Note.—In determining whether these animals were young, immature or old, I have not considered the presence or absence of occipital ridge, or the smoothness or otherwise of the fur. But have judged from the appearance of the teeth and sexual indications. It will be observed that in old animals there is invariably a strongly developed occipital ridge, an elongated appearance of the skull, and generally a bright, smooth coat. In young animals there is no occipital ridge, and the skull is rounder, while the coat is generally rough and has less pigmentation. Males are, of course, as in all the cats, much larger than females. These animals were all shot within a small area. They were all driven out singly, and were therefore sufficiently mature to be living alone. The old and the young respectively present those features which have sometimes led to their being divided into two species. They are undoubtedly all of one species, the features referred to being merely indications of age, such as one would naturally expect and not peculiar to this species.

In the Journal of 31st March, Captain Mosse reviews Mr. Hick's remarks on panthers and *pantherets* (!) in his book "Forty years among the wild beasts of India." I have already discussed this matter at length in another publication (*Pioneer*, October 1910). The experience of many years leads me to the conclusion, confirmed by recent observation, that the difference, between the two so-called species are generally, if not invariably, due to age. Size is no criterion; these, like other animals, vary in this respect, and it is impossible to draw a dividing line. As for measurements I doubt whether any female panther's head and body has measured as much as five feet in length, and I have never seen a panther with a tail as short as 2 feet; much depends, moreover, on the system of measurement, whether round the curves of the body, or in a straight line. Young

panthers, like young tigers, have rough skins. I have never seen an old panther with no occipital ridge.

The statement as to the number of caudal vertebræ is to be found in Sterndale's Natural History, where that author quotes Temminck. It would be interesting to know whether Mr. Hicks derived his statement from that source, or whether it is the result of personal observation.

R. G. BURTON, LIEUT.-COLONEL,

BARODA, May 1912.

94th Russell's Infantry.

[Possibly Mr Hicks, if he sees this note, may be disposed to forward his panthers' skulls and skins to the Society for examination.—EDS.]

No. III.—A LARGE OORIAL HEAD.

The other day I had the good fortune to secure two very good Oorial heads and thought that perhaps a photograph of one of them might be of interest. They were both shot in the same hill, Khair Murat by name, within 25 miles of Rawalpindi. The smaller head measuring 30" in length, and 10" circumference at base of horn, is in some respects the handsomer owing to its wide spread and larger radius. The measurements of the larger head as certified to by some friends are :—

Length Right horn $36\frac{3}{4}$ in. Left horn $37\frac{1}{4}$ in.

Circumference .. Right horn $9\frac{1}{2}$ in. Left horn $9\frac{3}{4}$ in.

If the tips of both horns were not broken they would probably measure close on $38\frac{1}{2}$ in.



Can you tell me if this is the authenticated record for Cis-Indus? The Trans-Indus Wana record is, I believe, 40 in. obtained sometime during the last hot weather. I see the *Indian Field Shikar Book* mentions one of 38½ in. shot near Attock, but it does not seem to be authenticated.

This same book implies that the Oorial and the Shapoo are indetical. Is this correct? I have never shot Shapoo but have shot a considerable number of Oorial, and have seen a great many of their heads from Baluchistan, Wazristan and Cis-Indus. I have certainly seen some Shapoo heads in which the ends of the horns seemed to curve back slightly something like Burrhel horns, but I have never seen this in a single Oorial head.

H. V. BIGGS, COLONEL.

RAWALPINDI, 6th January 1912.

[The Oorial or Shapoo are practically the same, the Shapoo being the Ladak name for the Oorial. The Cis-Indus variety is *Ovis vignei cycloceros* and the record head, according to Rowland Ward's "Records of Big Game, (5th Edition)" is 39½ (length on front curve), 10¾ (circumference), Punjab (locality), Major F. H. Taylor (owner). We reproduce the photograph of Colonel Biggs's 37¼ Oorial.—Eds.]

NO. IV.—THE SO-CALLED ONE-HORNED SHEEP OF NEPAL AND OTHER BREEDS.

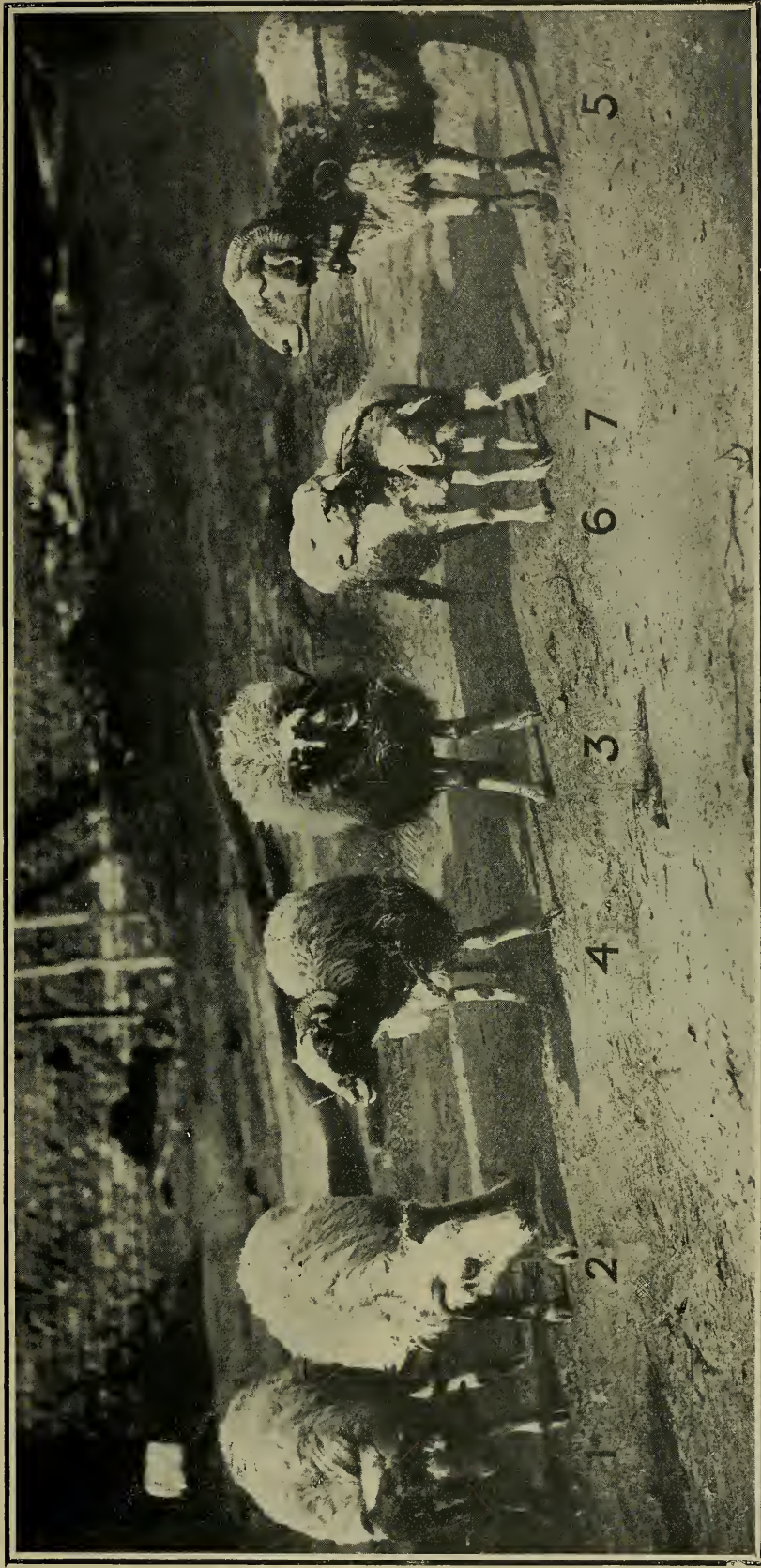
(With a Plate.)

I send a photograph of three of the typical breeds of Sheep in Nepal. The Prime Minister Maharaja Sir Chandra Shum Shere Jung has very kindly collected and presented me with a pair each of these three kinds of Sheep.

The Sheep in the photograph are as follows:—

- (1) Barwal (ram).
- (2) Do. (ewe).
- (3) Hunia (ram).
- (4) Do. (ewe).
- (5) Kagi (ram).
- (6) Do. (ewe).
- (7) Do. (lamb).

The rams of Barwal and Kagi make good fighting rams. The Hunia is sometimes used as a beast of burden. All three kinds are short-tailed sheep. There is another breed of Tibetan sheep which sometimes comes to Nepal, *viz.*, the Silling, which is the sheep mostly used to carry burdens. The Maharaja has not yet succeeded in obtaining a typical pair of these, but I believe they may be procured later.



TYPICAL BREEDS OF NEPAL SHEEP.

1. Barwal (ram).

2. Do. (ewe).

3. Hunia (ram).

4. Do. (ewe).

5. Kagi (ram).

6. Do. (ewe).

7. Kagi (lamb).

The small photograph is that of the so-called "unicorn" sheep. These sheep are "Barwals" and are really two horned sheep which have been converted into a one horned variety.



The Prime Minister has sent me the result of the enquiries instituted by him. The report is that to make the unicorns, the lambs when about 2 or 3 months old are branded with red-hot irons where the horns are sprouting. This prevents the horns from growing in the usual places and induces them to come out joined together from the top of the skull.

J. MANNERS-SMITH,
Lieut.-Colonel.

THE RESIDENCY,
NEPAL, 27th March 1912.

No. V.—SOME NOTES FROM THE ABOR EXPEDITION.



I send a Kakur (*Cervulus aureus*) head showing three distinct horns, or, if a small stud is counted, which is quite separate, it has four horns.

I found it in this village and thought it would be a nice addition to our museum.

I have discovered that the Takin (*Budorcas taxicolor*) extends into the Dihong Valley, for an Abor has a head here, which was taken off an animal which was washed down the river two rains ago. It must have come from some distance further up, as no one here had ever seen one before.

The red serow is quite common. I have got an $11\frac{1}{2}$ inch head.

I have not found the true Mahseer (*Barbus tor*) as high as this though 20 miles lower down they are common.

Here I have only caught the "boka" or "kalabano" and got one of 20 lbs. amongst a dozen or so over 15 lbs.

ALBAN WILSON, MAJOR,

8th Gurkhas.

GEKU, ABOR FIELD FORCE.

ASSAM, 12th February 1912.

No. VI.—DO CHINKARA (*GAZELLA BENNETTI*)

DRINK WATER?

Your correspondent, Mr. Pitman, refers to this question in the Journal of 31st March last. He will find that I fully discussed the matter in an article on "The drinking habits of wild animals" in 1908, in the Journal Vol. XVIII, p. 250?

The error as to these animals being "said never to drink" appears to have originated with the late Dr. Blanford, who has been followed by other writers. I have recently had my previous observations confirmed by seeing large numbers of this gazelle trooping down to drink in the middle of the day during a particularly dry season.

R. G. BURTON, LIEUT.-COLONEL,

94th Russell's Infantry.

CAMP, April 23rd, 1912.



1.—Young Male, horns $14\frac{1}{4}$ "



2.—Male, horns $18\frac{1}{4}$ " and $18\frac{1}{2}$ "



3.—Adult Male, horns $20\frac{1}{4}$ "



4.—Old Male, horns $17\frac{1}{8}$ "



5.—Female, horns 15 "

HEADS OF TAKIN, Budorcas taxicolor (front view), FROM THE MISHMI COUNTRY.

Mr. Pitman's experience of Chinkara drinking is very interesting. In his recent book Mr. Stebbing notes that the Chinkara is a desert animal and the more dry and sandy a place the better it suits him. Personally though I have often seen deer drinking, I have never seen an antelope do so, neither a Bluebull, a Black buck, a Fourhorn nor a Chinkara. They are keen on perennial streams and their neighbourhood, but chiefly for the sake of fresh young grass. In my experience antelopes are much harder than deer, and I have attributed this partly to the fact that they seldom drink water. I should be glad to hear whether anyone else has seen an antelope drink?

F. DEWAR, I.C.S.

BALAGHAT, C. P., 4th May 1912.

NO. VII.—RECOVERY OF ANIMALS FROM INJURIES.

In some of your recent issues I have seen notes of some remarkable recoveries from injuries in beasts and birds. The other day two such cases came to my notice. The first was a Sambhur stag, full grown, which was going perfectly well and sound when I shot him. On examination I saw a large hard thickening in the bone of the off hind leg below the hock. I skinned the part carefully and found that the bone had been fractured and set again without any shortening. From its appearance it must have been when the animal was quite young.

The second case was a solitary boar which I shot. He was a big beast 35½" at the shoulder with good tusks. There was a healed scar on his right shoulder and a soft lump which turned out to be an abscess full of foetid matter. Thinking it an old bullet wound I examined further and found the point of a boar's tusk about 2½" long firmly embedded in the bone of the shoulder blade where it had snapped off short. The external wound had healed up completely and the animal showed no signs of lameness.

W. J. H. BALLANTINE,
ASSISTANT POLITICAL OFFICER.

SADIYA, UPPER ASSAM,
5th January 1912.

NO. VIII.—NOTE ON TAKIN (*BUDORCAS TAXICOLOR*).

With 2 Plates.

In July of last year when just north of the Mishmi Hills at an altitude of about 10,000 feet, I was fortunate in finding a place frequented by a herd of Takin. This herd about 300 in number spent each night in the vicinity of a hot spring drinking the water and browsing on the trees around it. I

had a good opportunity of watching them for several days at a distance of about 80 yards as they emerged from the rhododendron and willow jungle to drink the hot water.

The first thing that strikes one on seeing the herd of animals is, the great variety of colour, ranging from very dark grey to a golden yellow; the animals are all conspicuously lighter on the withers and have a darker dorsal stripe. The very young ones are quite dark, the dorsal stripe being inconspicuous; the females are also dark having no trace of the yellow which is seen on the males. Adult males are light yellow over the withers and back and darker in other parts, while the very old and large males are a darker yellow.

The horns of the young grow straight up from the head with an outward tendency; later they grow outwards and upwards (see fig. 1); in the final stage the horns grow forwards, bend downwards and outwards, with the points growing up (see figs. 2 & 3). The horns are very deceptive as regards length, and even at a short range with a telescope it is difficult to pick a good head. The points of the horns of a young male which have not yet curled may be higher above the occiput than those of an older animal, a fact which makes it difficult to distinguish a large pair of horns. In shooting the animals I found it best to disregard the horns and to shoot the animals of largest size. The old males are quite easy to recognise being very much more bulky than the others and being darker in colour than the younger males.

In the figure which accompanies Mr. Pocock's paper in Vol. XIX of the Journal the neck appears to be too long and not nearly thick enough. The horns are longitudinally wrinkled and irregularly transversely ringed at the base but old horns (see fig. 4) are much smoother and the points being worn down, they are also shorter.

Takin are possessed of a very keen sense of smell but their alarm even when fired at, quickly subsides and they returned to the hot spring a few minutes after being driven away. Only on one occasion did I hear a sound uttered by these animals; this was a snort of alarm given by a female who walked up to where I was standing and did not see me until she was within six or eight feet; on hearing this the herd galloped off. On other occasions when alarmed, they were off without making any sound.

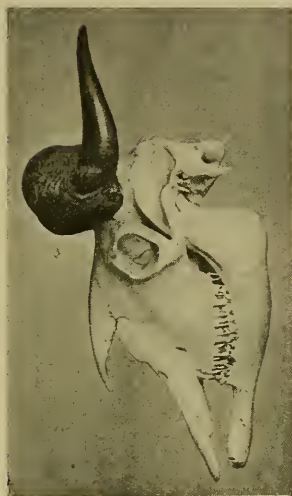
In the day time this herd remained in the dense rhododendron forest, but at 3 or 4 o'clock in the afternoon they would come down to the hot spring and stand in the water in a dense crowd sometimes pushing and bustling each other in their eagerness to drink the water. It is probable that they remained here all night, as before daylight they were still in and near the spring and could be seen browsing on the willows trees near the water. I was told that in winter no Takin are found at the hot



1.—Young Male, horns $14\frac{1}{4}$ "



2.—Male, horns $18\frac{1}{4}$ " and $18\frac{1}{2}$ "



3.—Adult Male, horns $20\frac{1}{4}$ "



4.—Old Male, horns $17\frac{1}{8}$ "



5.—Female, horns 15"

spring, but that this large herd breaks up into parties of 10 or 20 when it is with difficulty that the native hunters can find and shoot them. They are large heavy animals and should be shot with a heavy rifle.

The ground on which I saw these animals as well as that on which I saw tracks near Ta Chien Lu in Ssuchuan was steep, but it cannot have been nearly so steep as that which the late Mr. Brook describes.

I collected a good set of skins of different ages and sexes but unfortunately none of these survived the continual rain which fell when they were shot and while they were being carried back to India.

The Chinese name for Takin is "Ye-Niu" meaning "wild cattle." Near Tachien Lu the Tibetans call them "Ya-Go," but near Rima the Tibetan name is "Shing-Na." To the Miju Mishmis (*i.e.*, those living near Rima) they are known as "Kyem," while the Mishmis up the Dibang river (Chulik Atta tribe) call them "Akrön." The Abor name is "Siben-ö". Takin is the name used by the Digaru Mishmis who inhabit the country where the Lohit river approaches the plains.

The following are some measurements of those obtained:—

	Sex.	Head & Body.	Tail.	Ear.	Height.	Horns.
Number 1. (figs. 1, Pl. A. & B.)	Male	5' 9"	4"	4"	3' 3"	14 $\frac{1}{4}$ "
" 2. (figs. 2, Pl. A. & B.)	Male	..	..	..	..	18 $\frac{1}{2}$ " 18 $\frac{1}{2}$ "

The above two animals had very yellow coats.

Number 3. (figs. 3, Pl. A. & B.)	Male	6' 4"	..	..	..	20 $\frac{1}{4}$ "
" 4. (figs. 4, Pl. A. & B.)	Male	6' 4"	4"	4"	4' 5 $\frac{1}{2}$ "	17 $\frac{3}{8}$ "

These two were very large in size and darker than Nos. 1 and 2.

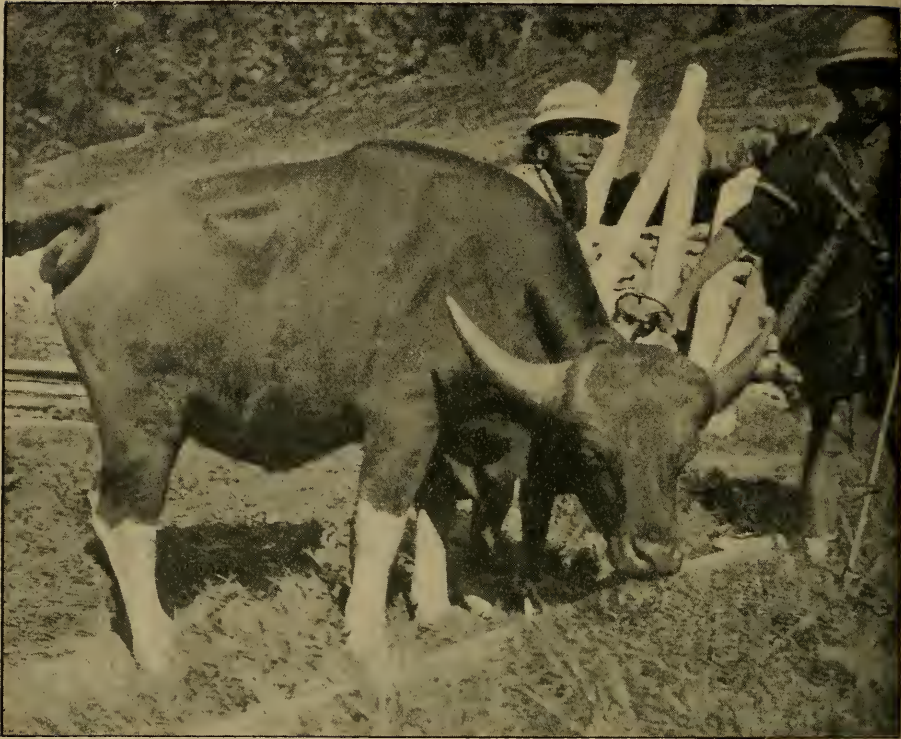
Number 5. (figs. 5, Pl. A. & B.)	Female	5' 6"	..	..	..	15"
" 6.	Female	5' 7 $\frac{1}{2}$"	..	..	..	14 $\frac{1}{4}$ "

F. M. BAILEY, CAPT.

ALIGARH, U. P., March 1912.

No. IX.—GAYAL OR MITHAN (*BIBOS FRONTALIS*).

The photo here reproduced is that of a tame Mithan and was taken in a Mishmi village. The Mishmis and Abors keep a few of these cattle. They are not milked. Specimens are as a rule similarly coloured though I have seen one with a white head. There are no wild Mithan in the Mishmi or Abor hills. I was once shown a skull which the Mishmis said was that of a wild Mithan; the horns of this specimen were longer and more curved than those of the tame cattle and the skull was evidently that of a Gaur. This had been killed by a native hunter in the plains at the foot of the Mishmi hills. The skin and skull of the animal in the photograph have been given to the Society.



The animal measured 85 inches from nose to base of tail and was 55 inches high. The horns are 16 inches in length, $14\frac{1}{2}$ inches in circumference and $30\frac{1}{2}$ inches between the tips.

F. M. BAILEY, CAPT.

ALIGARH, March 1912.

NO. X.—TSINE (*BIBOS SONDAICUS*) FOUND WITH
VILLAGE CATTLE.

The following may be of interest:—Last dry weather at the village of Kyaung-lé in the Kathir district of Upper Burma, a bull Tsine (*Bibos sondaicus*) came down alone and associated with the village cattle which were grazing in the reaped paddy fields adjoining the village. He remained there for all the dry weather apparently doing nothing beyond herding the cattle, as if by chance any of them showed signs of straying away he rounded them up and then settled down again exactly as a sheep dog would do. He apparently became quite domesticated paying no attention to the villagers looking after their cattle; in fact, Mr. Adamson, the Sub-Divisional Officer, Banmauk, was able to take a photograph of him at about

40 yards. So far the villagers assert he made no attempt to have connection with the village cows and at the end of the hot weather he retired into the jungle and was not seen again till last December when he reappeared among the cattle and resumed his former habits. About a fortnight ago, however, he was noticed to be paying particular attention to a young cow that had not yet been crossed, and after a few days he disappeared with her into the jungle and neither of them has been seen since. It remains to be seen whether either will return but they probably will and the result if any will be very interesting. I am glad to say strict orders have been issued that the Tsine is not to be shot or interfered with in any way. It is not an old bull and it is strange why it should have taken to this solitary life. Can it be that it has been driven out of the herds by an older and stronger bull and so forced to come to the village cattle for companionship? Considering the usual timidity and wariness of Tsine it seems extraordinary.

T. A. HAUXWELL,

Conservator of Forests, Burma.

BANMAUK, 26th February 1912.

No. XI.—NOTES ON BIRDS FROM LAHORE.

On April 30th, 1911, I saw a pair of Sparrows building in a Baya's (*Ploceus baya*) old nest in a Keekur tree. Thinking it unusual I put my glasses on them and found they were a pair of Rufous-backed Sparrows (*Passer pyrrhonotus*). On May 12th I looked them up again. Seeing both birds in the tree I climbed up and found they had four eggs of the finely freckled type. Incubation was advanced. I shot both birds to put the matter beyond doubt.

Again on August 6th, 1911, I saw a pair of this Sparrow building in another Baya's nest. On revisiting this locality I was sorry to see the egg chamber had been torn open from the exterior and no Sparrows to be seen. The curious part of this was that all the remaining Baya's nests had been treated in the same way! What could have done it? I thought the foregoing might interest some of the readers of the Journal as I see no mention of a similar occurrence in "Nests and Eggs" nor the "Fauna of British India" Birds. In May and June I saw many nests of the Golden Oriole (*Oriolus kundoo*) and with but few exceptions there was a nest of the Black Drongo (*Dicrurus ater*) in the same tree, in some cases on the same branch. Is this instinct or reason? Surely the Orioles know the great protection they obtain from the presence of the King Crows. On October 27th while taking a stroll near the Ravi, I heard a familiar note and on going up to the sound was pleased to see a Grey-headed Flycatcher

(*C. ceylonensis*) a bird I know well in the hills around Simla. In the "Fauna of British India" it is stated :—*Culicicapa ceylonensis*. Distribution. "The whole Empire, except Sind, the Punjab and Rajputana, from which provinces I have not seen any specimens."

A. E. JONES.

LAHORE, 14th December 1911.

[Major Magrath found this Flycatcher a fairly common winter visitor at Bannu and obtained one specimen as early as October.—J., B. N. H. S., Vol. XX, p. 777.—Eds.]

No. XII.—NESTLING PLUMAGE OF THE GREAT STONE PLOVER (*ESACUS RECURVIROSTRIS*.)

As I can find no record of the down stage of *Esacus recurvirostris* the following description may be worth noting. On the evening of April 14th, 1910, I found a clutch of two eggs of this species in the bed of the River Sutlej at Phillour, which were chipped. These I took, and with my aid both young birds hatched the following morning. They were described on the 16th as follows :—

Upper parts ashy grey, tinged with sandy, much of the down with black tips. A black line divides the forehead and crown extending to the anterior corners of the eyes, and curving downwards over the cheeks to the ear coverts, nearly meeting black lines, which start from the posterior corners of the eyes and almost join on the occiput. The eye lids are fringed with grey down, the lower bearing a single black spot. An indistinct and broken black line crosses the upper back and extends along the upper portion of the flanks to the tail. There are indistinct black spots on the back. Wing ashy grey but without the black tips to the down, the anterior edge of the forearm darker, a black spot at the inner angle of the elbow. Lower parts greyish white.

Bill, short and stout, culmen curved; dusky black, naval pits lighter. Eggtooth whitish. It is lightish brown. Feet plumbeous grey.

Call, a shrill chirrup, rather similar to that of a young sparrow.

H. WHISTLER, INDIAN POLICE.

RAWAL PINDI, April 1912.

No. XIII.—THE HIMALAYAN GREENFINCH (*HYPACANTHIS* *SPINOIDES*, Vigors.)

With reference to the discussion on this species started in the Journal [Vol. XX, p. 517] by Mr. Dodsworth, the following facts may be worth bringing to your notice. Col. Rattray in his article on "Birds nesting in the Murree Hills" in Vol. XVI of the Journal, p. 658, states :—"These birds

arrive suddenly at Murree about the middle of June and at once set about building, 3rd July was the earliest date on which I got eggs." Last year (1911) I had to spend a couple of days in May at the Police Rest House of Kotli, which is situated at about 5,400 feet in the hills south-east of Murree, overlooking the River Jhelum. While I was there I frequently noticed a flock of these birds in the neighbourhood of the bungalow and shot a couple [Skin Register Nos. 373 & 374, Kotli, 26th May 1911], which proved to be young birds that had only recently left the nest. The flock contained 15—20 birds.

These facts tend to show that after breeding early at a low elevation, the birds migrate for a second brood at higher levels, a theory that should easily be disposed off one way or the other.

H. WHISTLER,

INDIAN POLICE.

RAWAL PINDI, April 1912.

NO. XIV.—DISTRIBUTION, HABITS, AND NESTING
OF THE HIMALAYAN GREENFINCH
(*HYPACANTHIS SPINOIDES*, Vigors.)

A few years ago, when I first began to take an interest in this pretty little Greenfinch, I noticed that in the neighbourhood of Simla and adjacent ranges, it became tolerably common from about June (earliest date on which seen here up to this 4th June), to the end of October, and then seemed to disappear. Thinking that it was probably subject to a seasonal movement along these ranges, like some other hill birds, I consulted various books and papers on Ornithology, to which I had access, but found no mention of this, and yet I was certain that this species was not a permanent resident here.

In order, therefore, to clear up all doubts I made an enquiry (J. B. N. H. S. Vol. XX, p. 517) as to whether this bird was a permanent resident at moderate elevations. In addition to the replies received to this, and which are recorded in the Journal (*vide* Vol. XX, pp. 852 and 1152, and Vol. XXI, p. 262), I received the following from Mr. E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.

"The bird breeds at Darjeeling at elevations between 8,000 and 10,000 feet, and perhaps as low as 7,000 feet. Like most hill-birds, it moves up and down with the varying seasons, higher in the hot weather, and lower as it gets colder. I do not think one could call them migratory."

In view of the observations referred to above, I think there can no longer be any doubt as to this species being subject to a seasonal movement along these ranges, and it would, therefore, be more correct to give its distribution as follows: Common from about May or June to October along the

Himalayas at elevations of 6,000—10,000 feet, and, perhaps, even higher, from the south side of the Pir Panjal Pass in Kashmir (Brooks) to Sikkim (Blanford): also recorded from Manipur (Godwin-Austen). During the cold weather these birds move down to lower elevations, and the North-West Himalayan ones, at all events, are found in the Duns and plains (Bijnor to Pilibhit) at the foot of the mountains (Osmaston).

These Finches generally keep to the woody portions of the hills, and are gregarious, moving about in small flocks, except during the breeding season, when they pair off. They appear to be partial to certain localities in the station here, and are not to be seen in other parts of it at all. When once established at a particular spot, after their first arrival here, they frequent it with great regularity. The abundance of food supplies is doubtless the most important factor that influences selection, as they only come up here to breed: but it seems also essential for them that the hill-sides shall be fairly well wooded—those covered with Himalayan Cedars (*C. deodara*), and Blue Pines (*P. excelsa*), undoubtedly receiving the preference.

They are very fond of the ripe seeds of the sun-flower plant, and during their sojourn in Simla, these seem to constitute their chief diet. In order to secure these seeds, they visit the gardens and compounds here freely, When feeding, which is generally in the early mornings and afternoons, they are not at all shy, and allow one to approach quite close to them. The cocks, I have noticed, are gorgers; one will take up his position on a particular flower, have a few nips, then take a "breather," and start afresh. If by chance another cock happens to settle on the same flower, a battle usually ensues—both birds fighting in the air, and then quietly flying off in different directions. No twittering, as a rule of any kind, goes on among the birds while feeding, and their yellow and green plumage blends beautifully with the flowers; in fact to such an extent that at times it is difficult to catch sight of them even at close quarters.

Their flight is undulating and swift, and when passing across or overhead, it is not at all easy to catch sight of them, but their peculiar twittering, which is constantly uttered, betrays their movements.

There is some disagreement among ornithologists in regard to the notes of this bird. Adams states that its cry is very like that of the English Siskin, but Hume contradicts this and so does Brooks. The latter's description of its song is undoubtedly the best: he aptly likens it to the characteristic "beez" of a Greenfinch. This "beez," I may add, is only uttered by the cock, usually when perched on the topmost branch of a tree, and can be heard from a long distance off. The other note, which is also indulged in by the hen, is a soft twitter or "chick" constantly emitted, even when on the wing.

This Finch breeds in July and August, but the great majority of the birds lay in the last mentioned month. The earliest and latest dates on

which I have taken eggs are the 31st July (3 fresh eggs), and the 14th September (3 fresh eggs), respectively. I may, however, mention that on the 26th July of this year I found a nest containing four young ones, about a week old, and the eggs in this case must have been laid about the end of the first week of that month.

The highest altitude at which I have found these birds nesting is 7,000 feet, but by far the largest number breed at about 6,000 feet: I have never yet taken a nest below the latter elevation.

These Finches are gregarious in the strict sense, even to the extent of breeding in company, and it is curious that this point should have escaped the observations of Hume. I remember once finding no less than half a dozen nests within a radius of not more than 15 yards, and on another occasion, four nests within a radius of about 15 yards. I have several times found two nests quite close to each other, and once I took a couple of nests from the same tree. It is true that I have sometimes found isolated nests, but I consider this the exception, or, perhaps, what is more probable is that there were other nests close by which were not located. In connection with the gregarious habits of this bird, I extract the following *in extenso* from my daily Journal:—

21st August.—Took another nest containing five fresh eggs placed on a *P. excelsa*, about 25 feet distant from the tree, which contained the second nest mentioned above. In the latter case only two eggs were taken, but the clutch was probably not complete. My idea is that the bird to which these two eggs belonged, on finding her nest gone, forthwith went and deposited her remaining egg or eggs in to-day's nest. It is not unusual to find five eggs in a nest, but the above is corroborated to some extent by (*a*) our seeing *three* birds—two hens and a cock—hovering about in the vicinity, and judging from their anxious behaviour when the climber approached the nest, there seemed little doubt that it was a sort of "joint stock" concern, which belonged to them all, and (*b*) the fact that this nest a few days previously only contained three eggs: day before yesterday it still contained only three; to-day we were astonished at finding five!

I have never yet had the good fortune to witness the courtship of these birds, though I have frequently seen them *in copula*, after the manner of sparrows, near their nests. They pair off soon after their arrival here, and are shortly afterwards busily engrossed in domestic affairs.

They have only one brood annually, so far as Simla is concerned, and build a fresh nest each year: I have never known them ever to take possession of the nests of other birds, though on one occasion, I noticed a hen lining her nest with horse-hair taken from an old nest belonging to a Jungle Crow (*Corvus macrorhynchos*), which was close by.

I have already stated that these birds generally resort to hill-sides covered with Himalayan Cedars and Blue Pines, and these trees are *par*

excellence the ones which are chosen for nesting: I have never yet found a nest on an oak, though Hume records having done so. According to him the Deodar, by which he apparently meant the Himalayan Cedar, *Cedrus deodara*, is the favourite. Out of a total number of 29 nests, which have come under observation during the last few years, I find that the results in regard to the selection of trees by these birds are as follows:—

Himalayan Cedars (<i>Cedrus deodara</i>)	..	..	16	nests.
Blue Pines (<i>Pinus excelsa</i>)	..	..	11	„
Kharki trees (<i>Celtis australis</i>?)	..	..	2	„

When a Himalayan Cedar has been chosen, the nest is invariably placed on the upper surface of one of the horizontal branches, generally towards the extremity; and in the case of a Blue Pine, in one of the uppermost forks or tufts. In the “Kharki” trees, the two nests were built on the outer ends of the branches, where they had been pollarded for the village cattle. They were all firmly attached to the boughs or twigs (in whichever of their positions they happened to be placed). The feature about these nests, however, is that no matter what their position may be, or on what trees they are placed, they are all without exception *well* hidden: in fact so admirably is concealment effected that, if not discovered during the process of construction, it would be almost impossible to find them afterwards. Every advantage is taken by the birds of a thick tuft, or bunch, or cluster of leaves under which to build their nests, and I am firmly convinced that these elaborate precautions are taken, not only as a safeguard against possible enemies, but also as a *protection against the heavy showers of rain*, which we usually have in these parts in August, and this is the month during which most of these birds lay. I have frequently made a point of examining the tenanted nests after very heavy showers of rain, and have always found them to be absolutely dry—a marked contrast to some of the nests of *T. lineatum*, which are still to be found at this time, and which are usually wet and damp. Another point worth mentioning is that a large number of finished nests are deserted, and this, I think, is due to their not being found sufficiently water-tight on completion. What adds colour to my supposition is that, on examining these deserted nests, I have always found them to be soaked with water. As illustrating how well these nests are concealed, I give below the substance of a note from my daily Journal.

About the beginning of the second week of August, one of my hunters found a nest of this bird being built. He visited the tree two or three times, and after allowing sufficient time for the full complement of eggs to be laid, I accompanied him to the spot early in the morning to take them, but on examining the branch the man reported that the nest and eggs had disappeared! I could hardly credit this, as the nest had been inspected only the evening before and it then contained three eggs. Before leaving the spot, I told the man, as a last hope, to break the leaves from the branch,

near the spot where the nest had been, and to make a further careful search, and on his doing so, he found the nest and eggs. And yet the whole time, he had been standing on the branch not more than half a dozen inches away from the nest!

The nest takes about a week or nine days to complete, and the hen alone, in addition to carrying the materials, is the sole architect. The cock follows her about but gives her no help whatever. The time when the hen is most active in carrying materials, while building is progressing, is from early in the morning to about 10 or 11 A. M., and this is *the* time to locate a nest. Between 11 A. M. and 3 P. M. occasional trips are made to the nest, and then only after long intervals. After 3 P. M. building operations cease for the day. A great deal of twittering goes on while the hen is in the nest, and when the latter is nearing completion, the birds are frequently to be seen pairing near it.

The nests are compact, neat, cup-shaped structures, composed chiefly of stalks and roots of grass and small plants, and other such like materials (one only of my nests has a thin coating of moss—Hume says that there is *much* moss blended with the exterior), and lined interiorly with very fine grass-roots, thin fibres resembling coir, horse-hairs, and a few feathers, and occasionally bits of cotton. The dimensions of 12 nests agree generally with those given by Hume.

The heights of the nests varied from 6 to 65 feet, but the average height of 29 nests was 30 feet.

In some cases I noticed that the birds commenced laying immediately the nests were completed; while in others, a short period elapsed.

The number of eggs varied from 3 to 5, but the normal complement is 4. The largest number of young ones found in a nest was 4, and the smallest number of well incubated eggs was also 4.

The eggs are laid one daily, and the hen usually begins to brood after the second egg has been laid.

The hen alone performs the labours of incubation, and while sitting in the nest is fed by the cock. The young are hatched in 13 days, and both birds help in feeding them. They leave the nest in about a fortnight, and follow their parents about for some time, and are fed by them.

The eggs of this bird are excessively delicate looking and pretty. The colouration of both unblown and blown eggs is generally as described by Hume, but there are some slight differences, which become apparent, in a large series. I have before me at present 46 specimens, which exhibit the following variations as compared with Hume's account.

"The eggs when fresh are a delicate, slightly *greenish-white*," usually with an irregular ring, and occasionally with an irregular *cap* of minute blackish-brown spots round the large end, and the *majority* have a few similar specks scattered here and there over the body. In addition to the

blackish-brown spots forming the irregular rings or caps, some specimens have specks of various shades of reddish-purple.

After a very short time the blown specimens unfortunately change colour, and the ground colour becomes "a very delicate pale sea-green," but the blackish-brown and reddish-purple specks remain unchanged.

With reference to fresh eggs, I take this opportunity of mentioning that when blowing the specimens, great care should be exercised, as the spots are liable to run.

The general shape of the eggs is an oval, a good deal pointed towards the small end; but a few (and these are rare) are somewhat elongated, with blunt ends. One or two of my specimens, apparently deformities, are almost elliptical in shape.

In size they varied from .67" to .68" in length, and from .52" to .58" in breadth; but the average of 46 specimens measured was .73" \times .55". The average weight of 25 fresh eggs was 29.94 grains.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 12th June 1912.

NO. XV.—THE LONG-TAILED GRASS WARBLER (*LATICILLA BURNESI*, Blyth.)

The distribution of this species is given in the Fauna [Vol. II, p. 380,] as "Upper Sind from the junction of the Chenab and Indus rivers to Larkhana, and also on the Eastern Nara, where Doig found this species breeding. Jerdon records it from Monghyr on the Ganges in March."

Hence I was somewhat surprised to find that this curious little bird is a very common resident in the grass jungles that border the River Sutlej on its passage through Ferozepore District.

They are to be met with both in pairs and in small parties and habitually frequent the lower portions of tufts of grass which they tread in a mouse-like manner, but before entering the tuft they usually perch on an outer stem for a few seconds, which renders the task of securing specimens fairly easy. The song is short but quite sweet, and in addition they have several scolding notes with which to greet the intruders.

I failed to secure eggs, but on April 8th found a nest containing 3 half-fledged young. This nest was large for the size of the bird, cup-shaped, and placed low in a grass tangle, growing round some dwarf tamarisk. It was made of grass and grass down, the latter being welded into a somewhat felt-like lining. Two similar nests were found and attributed to this species, but they had obviously been used and left. The nests are very difficult to find.

On occasion these little warblers can be confiding enough. One evening I was lying in a thick patch of jungle at the edge of the river watching a

gaggle of barheaded geese when one *Laticilla* came and ate something on the ground within a yard of my face.

H. WHISTLER,
INDIAN POLICE.

RAWAL PINDI, April 1912.

NO. XVI.—NIDIFICATION OF BURMESE GREAT BLACK
WOODPECKER (*THRIPONAX FEDDENI*.)

To-day (February 6th) I have obtained the eggs of this species from a tree close to my present camp, about 15 miles east of Thayetmyo.

Yesterday one of my elephant attendants reported to me he had found the nest-hole, and that the bird, a black and white woodpecker, had flown out and that he had felt the eggs. I was rather doubtful as to the truth of his statement, but the same afternoon proceeded with him to inspect. He took me to a "Letphan" tree standing in an old clearing, all around being "Kanig" grass interspersed with a few tall trees. Locality close to banks of a broad creek. I saw the nest-hole at once, and as we were talking the bird flew out, an undoubted specimen of the Burmese Great Black Woodpecker. I did not shoot it, although it offered many opportunities, as it kept flying from tree to tree close at hand, uttering its rancous call, because I was not yet certain whether the hole contained eggs.

The Letphan tree in which the hole was made, was about 2 feet in circumference, the hole was situated about 14 feet up the hole and lying at foot of tree there was a small heap of soft wood chips of the Woodpecker's excavating. Had it not been for the thorny spikes with which the stem was covered, the tree presented no difficulties in climbing. These spikes, however, we knocked off with a stick, and I swarmed up, but was disappointed to find I could not reach the bottom of the hole, as the entrance was too small to allow of more than the half of my forearm to pass through. The attendant with me could do no better. I then questioned him as to why he had told me that four days previously he had felt eggs, and he told me that at that time the hole was not so deep.

To-day I sent one of my servants, a small boy, whose arm would be likely to pass through the hole to feel in the nest for eggs, but alas quite contrary to my orders. Not only did he feel, but he took the two eggs and brought them back to me. Had I known there were eggs, I would have had them taken in my presence, and at the same time shot the parent bird.

The eggs are pure white, very glossy with a certain amount of transparency, and are fragile, considering their size. They measure 1.35×1.0 .

Apparently the nest-hole was 1 foot deep, and as far as I could feel almost the whole of the small tree had been hollowed out, and only a thin surrounding wall about 2" in width being left.

The interesting point is, the bird, if my man's story is true, continued excavating after the eggs had been laid. Is this a usual practice with Woodpeckers I wonder? If so, it may be that the birds continue to excavate, as incubation of eggs progresses, in order to have a sufficiently large enough chamber prepared to receive the young.

The incubation of eggs I took had well set in, and in another 5 days would have been impossible to blow.

J. P. COOK.

CAMP. 6th February 1912.

NO. XVII.—A KITE'S LARDER.

Yesterday I saw here a common Pariah kite (*Milvus forinda*) sitting on the edge of what appeared to be a large nest built in an Indian cork tree (*Millingtonia hortensis*), and as it refused to move, although several stones were thrown at it, I climbed the tree to see if the nest contained any eggs.

To my surprise I found that the nest contained no eggs, but a regular larder containing several dead squirrels, parroquets, crows and some old bones, all in various stages of decomposition, showing that the bodies had been placed there at various times. We had been shooting squirrels and parrots, etc., lately, as they had been a nuisance.

The nest appeared to belong to three kites, all of whom appeared to be adult birds, and all of whom came to the nest at various times to feed.

Is it a common practice amongst these birds to make a larder?

G. L. REMINGTON.

BANDIKUI, RAJPUTANA, 18th February 1912.

NO. XVIII.—OCCURRENCE OF THE COMMON PEAFOWL (*PAVO CRISTATUS*, Linn) IN THE NEIGHBOURHOOD OF SIMLA, N.-W. HIMALAYAS.

The Common Peafowl (*P. cristatus*) has generally been supposed not to be a bird of high elevations, but this is hardly correct so far as these parts are concerned. It is common in the Ghana-ka-hati Jungles, (elevation about 5,500 feet), in the Dhami State, which are reserved for His Excellency the Viceroy, and which are not distant more than seven miles from Simla. Again it is found in considerable numbers below the cart-road in Patiala territory, about 8 or 9 miles from Simla, and at about an elevation of 5,000 feet. Lastly a pair of these birds, which were

doubtless stragglers, were seen on the 25th April 1912, on the Kalka-Simla Railway line, a little beyond the Tara Devi Station (elevation 6,050 feet).

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 30th April 1912.

No. XIX.—SWINHOE'S SNIPE (*GALLINAGO MEGALA*)
NEAR MADRAS.

I am sending you by registered parcel a specimen of Swinhoe's Snipe (*G. megala*) which I shot on 3rd March at Tindivanam some 75 miles south of Madras. I regret it is somewhat damaged. The specimen was skinned for me at the Madras Museum, and the measurement are those made by the Museum. The bird was only recognized on examining the bag on the homeward journey.

MADRAS, 20th April 1912.

R. F. STONEY.

There were several specimens of this snipe shot in Madras this season, all in the Chingleput district. Mr. R. F. Stoney had two, my partner Mr. Graham Ross shot one, and I had three.

I am afraid my partner and I would have passed them over as Pintails, had we not known that Mr. Stoney shot one early in the season.

I. S. FRASER.

MADRAS, 26th April 1912.

No. XX.—CRUELTY TO WILD FOWL, &c., IN SIND.

While shooting in Manchar Lake during January and February, I have noticed the following cases of cruelty to wild fowl, &c., and should like to bring them to the notice of the Society:—

(a) *Egrets*.—These birds are caught and blinded, in order to prevent them escaping. Each bird I am informed yields about Rs. 6 worth of feathers, per annum.

(b) *Heron*s are similarly blinded, kept in captivity, and used as decoys.

(c) *Duck, Geese, Coots, &c.*—A net $\frac{1}{4}$ to $\frac{1}{2}$ mile long and about 7 feet high from the water is put out in a likely place. At night, men in boats approach the birds feeding near by and without putting them up drive them slowly in towards the nets; when near enough, lighted torches are thrown at the birds and thus suddenly alarmed they fly off low along the water and get entangled in the nets. The owners then take them out, *break their wings and very often their legs as well* to prevent them escaping and in this state keep them alive for days. My Shikari informs me that a good many are sent to Karachi for sale there.

Any day one can see four or five nets up and I believe that in a successful drive as many as two to three hundred birds are obtained.

Fishing by means of nets, night lines, spearing, &c., is carried on all the year through, no close season being apparently enforced.

C. H. ELLIOT, CAPT.,

58th Rifles, F. F.

QUETTA, BALUCHISTAN,

11th February 1912.

[Major Magrath has already drawn attention in this journal and other papers to this abominable practice of maiming wild fowl in the Punjab. The Commissioner in Sind has informed us that he is making full inquiries with a view to such action as may be practicable.—Eds.]

No. XXI.—THE HIMALAYAN SNOW COCK (*TETROGALLUS HIMALAYENSIS*).

I send a photograph of the Himalayan Snow Cock, 'Ramchukor,' taken by me.

These birds were caught when quite young and now are free to roam about the garden and are very tame, as they will feed out of my hand when I whistle their call to them. Their plumage just at present is in its most perfect state, the heavy chess board game marking is very pronounced, the collar and ruff below the bill on the neck stands out very strongly as you can almost see the photograph. They are as heavy as a



good home capon. They are terrible gardeners; bulbs have no chance at all and any root they think good to eat is speedily dug up and demolished. I am sorry to say they are all female birds. The only cock was damaged by a fox and had to be put out of his misery. They spend a good deal of their time, especially in the evening, on the roof of the house and call splendidly, often about the same time as the Moslem Mullahs call to evening devotion. This certainly is the habit of these birds, to group in the evening on their mountain resorts, before they climb up into cliffs for the night. Eagles, and in the summer months foxes, are their deadliest foes. They are not easy to shoot, as they are wary to a marvellous extent, and their feeding grounds are pretty much the same as the Markhor and Ibex, and one rarely sees them therefore except when stalking the two latter lords of the mountains, and a shot gun has no place then.

W. G. APPLEFORD.

GILGIT, KASHMIR.

29th January 1912.

No. XXII.—WOODCOCK (*SCOLOPAX RUSTICULA*)
IN SOUTH ANDAMANS.

I saw a Woodcock near the town of Aberdeen, South Andaman, on the 26th January. I send you a note of the occurrence as I do not remember to have heard of the woodcock being reported as yet from these Islands.

J. H. WHITEHEAD, MAJOR,
93rd Burma Infantry.

PORT BLAIR, ANDAMAN ISLANDS,
3rd February 1912.

No. XXIII.—NOTE ON THE HABITS OF SWINHOE'S REED-
WARBLER (*UROSPHENA SQUAMICEPS*) AND ON THE
NESTING OF THE BURMESE GREAT WOODPECKER
(*THRIPONAX FEDDENI*).

I posted to you yesterday a box containing skins of (1) Swinhoe's Reed-Warbler (*Urosphena squamiceps*) and (2) Tweeddale's Scimitar Babbler (*Pomоторhinus nuchalis*).

Of the former bird Oates writes in the "Fauna of British India" (Birds, Vol. I): "This rare Warbler has been once procured at Bankasun in the South of Tennasserim, by Davidson * * * * * Nothing is known of its habits."

I found this bird comparatively common in the tract I have been touring in lately, *viz.*, the forests on the Eastern slopes of the Pegu Yonas or range dividing Sittang from Irrawady rivers situated about 60 miles due east of Thayetmyo.

The date of first bird seen was January 26th, the last occasion on which I noticed one, being March 12th. Between these dates I saw many birds and had good opportunities of watching their habits. They frequent the edges of densely forested streams, but one more partial to those parts where kaing grass grows. They feed mostly on the ground creeping about amongst the leaves in the thickest of scrub, but occasionally coming out into the sandy creeks hunting for insects amongst the drift-wood. I found one bird I shot had been feeding on very small black beetles found in the sand.

I only found the birds singly and they are hard to discover, until they make their presence known by their note, a soft low 'chip' 'chip,' this note being almost invariably uttered on being disturbed. They are by no means shy birds and not until they are approached very closely do they fly, or rather flit to some other bit of thick scrub.

I have been fortunate in obtaining for our Museum one good specimen, as it is very difficult to procure the birds without very much damaging the skins, as owing to their skulking habits, they have to be shot at a very close range and out of seven birds shot I only procured 4 specimens worth preserving.

Tweeddale's Scimitar Babbler (*nuchalis*) is a very common bird in the Pegu Yoma forests, but I thought our Museum would be glad to receive a specimen.

Great Black Woodpecker (*Thriponax feddeni*).—I have already reported the taking of this bird's eggs on February 6th. On the 18th of same month, I noticed another bird of the same species excavating its nest hole. I watched its nest and on March 1st took from it two fresh eggs.

Thriponax feddeni appears to be an early breeder and somewhat irregular, as just about the same date as I found the bird excavating its nest hole, my men found another nest of almost fully fledged young, the date being about February 17.

J. P. COOK.

THAYETMYO, March 26th, 1912.

[We are very glad to receive these skins which are new to our collection.—EDS.]

NO. XXIV.—CHINESE GREY DUCK IN BURMA.

From the Rangoon Gazette, dated 16th January 1912.

I have great satisfaction in recording what I believe to be the first authentic record of the Chinese Grey Duck (*Anas zonorhyncha*) in Burma.

During our Christmas shoot at Tongyi, Mr. D. H. M. Boyle on 26th December was lucky enough to shoot one of a pair (female) of the above species. In the flesh the difference between it and the common Burmese Grey were most noticeable, and on comparison with a hen of that species the following points were noted.

Chinese Grey Duck (female).—Wing much more pointed, the 1st and 2nd quills being of the same length, 3rd $\frac{1}{4}$ inch shorter than 2nd, 4th $\frac{3}{4}$ inch shorter than 3rd, 5th $\frac{1}{2}$ inch shorter than 4th. The two conspicuous black shields (which are red in the true spotted-billed Duck) absent, their place being entirely covered with feather. The yellow patch at the end of the bill much narrower. The underwing coverts (inside wing) pure white. Breast and under parts tinged with rust colour, and boldly streaked with blackish brown, and not conspicuously spotted as in the Burmese Grey Duck. *Speculum*.—Consisting of firstly, a very narrow irregular greyish white line, followed by a black one, both the above bars on the feathers immediately above a wide dark greenish blue band, below this another black band, some of the feathers narrowly edged with white. The outer edge of only one long secondary wing feather edged with white. In fact very little white in the wing when compared to the Burmese species. When fresh the coloured bar in the wing was a decided blue with a green tinge. It has now faded to a dull green. Legs much paler, in colour and not a bright red.

Burmese Grey Duck (female).—Wing rounded, and quill $\frac{1}{4}$ inch longer than 1st, 3rd equal to 1st, 4th quill $\frac{1}{2}$ inch shorter than 3rd, 5th quill $\frac{1}{2}$ inch shorter than 4th. The underwing coverts tinged with grey at their extremes. At base of the bill two conspicuous black shields. Breast and underparts spotted with round blackish-brown spots. *Speculum*.—Firstly, a band about half an inch white, then a narrow black band. Then a broad dark green band followed by a black band, feathers below edged with white. The outer edge of *three* of the long secondaries edged with white. The green on the speculum being wider than in the Chinese Duck being on ten feathers while in that species it is on only eight feathers.

Burmese Grey Duck.—It may be as well to point out the differences between the sexes. The male, besides being larger in size, has the rump and tail coverts both above and below black glossed with green, the female dark-brown only. The male has more white on the secondaries, and breast more boldly spotted with black. Occasionally in old males the bright red feet edged with black.

I give below a list of the bags made at Tongyi, Tankobin, and Nawngmun (Shwepi) this last Christmas week, made by three different parties. Also the bags of Christmas shoots in 1895, 1896, kindly given me by Major W. H. Whitehead and Mr. E. Gabbett.

			Tongyi.	Nawngmun.	Tankobin.	Shwepi, 1895.	Shwepi, 1896.
Grey-lag Goose, <i>Anser rubrirostris</i>	..	..	..25	34	13	23	46
Bar-head Goose, <i>Anser indicus</i>	..	..	....	..	..	1	..
Brahminy Duck, <i>Casarca rutila</i>	..	..	.. 4	2	5	6	..
Nukhtas, <i>Sarcidiornis melanonota</i>	..	..	....	..	2	1	..
Burmese Grey Duck, <i>Anas haringtoni</i>	..	..	..35	4	3	9	10
Chinese Grey Duck, <i>Anas zonorhyncha</i>	..	..	.. 1	..	..	..	..
Pin-tail Duck, <i>Dafila acuta</i>	..	..	..18	9	6	41	39
Gadwall, <i>Chaulelasmus streperus</i>	..	..	.. 1	..	..	41	20
Widgeon, <i>Mareca penelope</i>	..	..	.. 1	..	..	4	4
Shoveller, <i>Spatula clypeata</i>	..	..	.. 1	1	..	34	35
Tufted Duck, <i>Fuligula fuligula</i>	..	..	..19	64	24	53	122
Common Pochard, <i>Nyroca ferina</i>	..	..	....	..	..	..	3
White-eyed Pochard, <i>Nyroca africana</i>	..	..	.. 3	..	..	18	20
Common Teal, <i>Nettion crecca</i>	..	..	..36	10	32	52	41
Garganey Teal, <i>Querquedula ciria</i>	..	..	..22	..	16	23	142
Cotton Teal, <i>Nettapus coromandelianus</i>	..	..	....	..	1	0	29
Whistling Teal, <i>Dendrocyena javanica</i>	..	..	....	..	..	2	51

Note.—Burmese Grey-Duck.—Of the 35 shot at Tongyi, 3 showed slight traces of red on the bill evidently due to “spot-bill” blood and one each at Nawngmun and Tankobin, in none were the spots perfect.

White-eyed Pochard.—Major Whitehead says in 1895-96 he did not know the difference between the Eastern and Western birds, and some may have been the Eastern white-eye (*N. baeri*).

Whistling Teal.—Major Whitehead also says no account was kept of these whether they were the larger or smaller species.

Grey-lag.—Several shot this year, had the nail at the end of the bill dark horn colour instead of whitish. I could however see no other difference between them and the other grey-geese shot at the same time. This year there was a great deal of water about and birds not all plentiful. In Mr. Gabbett's note for 1896, he says very little water and birds plentiful.

H. H. HARINGTON, MAJOR.

XXV.—NIDIFICATION OF DAVISON'S BABBLER (*TURDINULUS EXSUL*).

During a recent visit to Mandaung (Toungoo Hills), I found the nest of Davison's Babbler, *Turdinulus exsul* (186a). At least I think it must be

this bird I shot off the nest. It is the same as is referred to on page 670 of the last number of the Journal as *Turdinulus roberti*. I will, in the meantime, describe the nest. It was in a screw-pine on a pad of dead bamboo leaves. From the pad other dead bamboo leaves seemed to have been made to stand up bound round with other leaves. The height from the pad was 6-inch ending in a dome. Entrance at side and very large for so small a bird. Below bottom of entrance was a hollow cup of fine grass. The whole like a shelter chair one sees at the seaside. The date was the ninth of April. Three eggs, pure white not smooth nor glossy, in shape a pegtop. One broken on nest. One my man broke. All very hard set. I gave the third to ants to clean, but they so discoloured it and ate the opening that I had to throw it away. Unfortunately I had not measured them.

RANGOON, 14th May 1912.

S. M. ROBINSON.

NO. XXVI.—THE SHELDRAKE (*TADORNA CORNUTA*) IN THE UNITED PROVINCES.

In November I shot a pair of Sheldrake in the Sitapur District, U. P., near the Ghogra river. I understand that these birds are very rare in this part of India.

MUSSOORIE, 20th April 1912.

F. B. SCOTT.

NO. XXVII.—NOTES ON SOME BIRDS FROM THE CHINDWIN VALLEY.

The following may perhaps prove of interest, as I do not think any of the birds enumerated have previously been recorded from the Chindwin.

1411. *Anthropoides virgo*—Demoiselle Crane. I saw and fired at a pair of these birds on a sand bank about 40 miles above Kindat on December 28th, 1911. As I had them under observation with a powerful glass for at least 10 minutes before firing, there can be no possible mistake. In view of our scanty knowledge of the Cranes of Upper Burma, it may be worth recording that Mr. Dove, Executive Engineer, tells me that when engaged on road work on the Chinese Frontier, near Bhamo, he frequently saw and several times shot Demoiselle Cranes. As I also recorded this species from Aracan, it is probable that the birds are fairly frequent visitors, at all events to Northern Burma.

1491. *Larus brunneicephalus*—Brown-headed Gull. On New Year's Day, 1912, I saw a single gull flying along the Chindwin river, not far from Monywa. I could not identify the bird with certainty, but have little doubt it belonged to this species, with which I was well acquainted in Aracan.

1609. *Fuligula fuligula*—Tufted Duck. I shot a male, one of a small flock, on January 5th, 1912, on a jheel about 30 miles south of Monywa.

1207. *Hieraëtus fasciatus*.—Bonelli's Eagle. On January 7th, 1912, when duck shooting, I found an eagle's nest on a cotton tree. On sending a man up, a large eagle, of a species unknown to me, flew off the nest and the climber reporting two eggs, I pursued and shot the eagle, which proved to be a fine female of the abovenamed species. The bird measured length 29·5 : tail 11 : wing 20·5 : tarsus nearly 4. The eggs, dirty white, faintly blotched at the large end with pale yellowish brown, measuring $2\cdot64 \times 2\cdot2$ and $2\cdot72 \times 2\cdot2$.

1255. *Falco peregrinator*.—Shahin Falcon. On April 15th, 1911, I saw a falcon go into a cleft in a sandstone cliff on the river bank, about 60 miles above Monywa. The cliff was of no great height, and by letting a rope down from above, a man easily climbed up to the nest. He reported three young birds which I left, in the hope that the birds would breed again this year. Yesterday, March 7th, 1912, I again visited the spot and had the pleasure of taking from the same hole two beautiful eggs which proved to be about half set. With some compunction, I shot the male bird, which arrived with a parrot (*P. torquatus*) in his claws. Whilst the nest was being robbed, the female flew round screaming (she did the same last year); but made no attempt to attack the man, and she returned to the nest-hole as soon as we left. I much regretted shooting the male, as it turned out that my identification was correct, and his death was therefore unnecessary; but as these falcons are by no means uncommon, I have considerable hopes that the female may find another mate, and that more eggs may be forthcoming. There was no attempt at nest, the eggs being deposited on the bare earth. They are much more richly marked than the one described by Hume: the ground colour is pinkish, densely freckled all over with minute specks, and sparingly blotched at the small end with small spots varying in colour from rusty to sepia, the latter being less numerous than the former. The spots increase in size towards the large end, where they coalesce to form a rust-coloured cap speckled with sepia. The eggs measure about $2\cdot1 \times 1\cdot5$.

1553. *Anastomus oscitans*.—The Open-Bill. I have just noticed that this bird is put down by Blanford as being unknown in Burma except in Aracan and Pegu. As a matter of fact, it is common enough on the jheels of the Lower Chindwin, though I do not recollect seeing it in the Upper Chindwin.

CYRIL HOPWOOD,

MONYWA, U. BURMA, 17th March 1912.

D. C. Forests.

No. XXVIII.—BAIKAL OR CLUCKING TEAL (*NETTION FORMOSUM*) SHOT IN ASSAM.

I am sending the Society the skin of a Baikal or Clucking Teal which was shot near Sibsagar, Assam, in January or February 1910 by Mr. Morton Eden.

Mr. Eden had no idea that he had shot a Baikal Teal till he had gathered the duck shot, some 40 or 50. It was apparently amongst a flock of Common Teal.

Most of our shooting is done in the fog starting at daybreak, as when the fog lifts, all good ducks go off towards the Brahmapootra. It would not be an easy matter to recognize birds under these circumstances; you hear the rush of wings and it takes you all your time to mark where they are coming from, and if you are not very quick they pass before you realize this.

DEKHARI TEA CO. DEOHALL DIVN.,
ASSAM, February 1912.

FRANCIS W. GORE.

Mr. Harrison has written to me with reference to a Clucking Teal (*Nettion formosum*) he shot near Lainekusi as follows:—"On the 24th of February last, in company with Mr. R. S. Pearson, Forest Economist, Dehra Dun, I visited a Bhil close by here to look for duck, a flock of Gadwall (*Chauliastur streperus*) got up and flew over Mr. Pearson; one solitary Teal flew in my direction which I shot. We both decided that it was an uncommon specimen. The bird made no sound at all and flew like a Common Teal."

DIBRUGARH, 3rd May 1912.

EVAN A. EVANS.

NO. XXIX.—INSECTS IN THE NESTS OF THE COMMON
SWIFT (*CYPSELUS AFFINIS*).

On examining the nests of these Swifts I noticed that some of them swarmed with insects, which I thought were parasites of these birds. The Hon'ble N. C. Rothschild has recently identified these insects as beetles belonging to two species of Dermestidæ; the one being *Anthrenus fasciatus*, Hbst., and the other an *Attagenus*. This gentleman adds *in epist*:—"I do not think that the specimens in question are really parasites of the Swift; in fact, I feel sure, they are not, but the larvæ feed on old feathers and similar refuse, which explains their presence."

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 30th April 1912.

NO. XXX.—DISTRIBUTION OF THE CRICKET
SCHIZODACTYLUS MONSTRUOSUS.

It may be of interest to note in regard to the distribution of *Schizodactylus monstruosus*, I have frequently found this curious cricket whilst digging in sandy soil in the vicinity of Campbellpur and Nowshera. It would seem, therefore, that it has a much wider distribution than given by Lefroy in his "Insect Life in India." Natives have assured me that this insect feeds on flesh.

MULTAN, 16th March 1912.

W. P. C. TENISON, LIEUT., R.F.A.

No. XXXI.—INTELLIGENCE OF ANTS.

Last year I kept some colonies of ants in glass nests, as recommended by Lord Avebury. One evening I placed some golden syrup near a nest. In the morning, instead of the clear syrup, I found a thick black paste. I took this away and put a fresh supply of syrup. One or two ants came and felt it with their antennæ, and then went off and returned with dry grains of dust, bits of stick, etc., and placed them on the edge of the syrup. After a short time the edge of the syrup became firm enough for the ants to mount on it without sticking, and so they gradually converted the whole into a stiff paste. They then moulded the paste into little balls with their jaws and antennæ and thus carried it into their nest.

MUSSOORIE, 20th April 1912.

F. B. SCOTT.

No. XXXII.—THE CASTOR RUST (? *MELAMPSORELLA*
RICINI, De Toni).

With plates A & B.

* The rust on Castor was first described about the year 1815 by A. de Bivona-Bernardi as *Uredo ricini* occurring in Sicily. Later on it was described as *Ceoma ricini* by Von Schlechtendahl in "Fungorum novorum et descriptorum Illustratione publicat" in Linnæa, Vol. I, p. 612, 1826, the *Uredosori* being apparently taken for *Aecidia* of the *Ceoma* type. In 1878 again it was named *Melampsora ricini* (Biv-Bern) Pass. by G. Passerini in Baglietto F. de Cesati V. and de Notaris G. "Erbario crittogamico Italiano" Ser. II, Fasc. XIV, No. 684. The name was yet again changed by de Toni in Saccardo's Sylloge, Vol. VII, p. 596, to *Melampsorella ricini*. It is still doubtfully referred to the genus *Melampsorella*, presumably on account of the similarity of its *Uredo* stage to that of *Melampsorella caryophyllacearum* (D. C.) Schroet.

I am indebted to Dr. Butler, Pusa, for letting me see a specimen with description and figure from Briosi and Cavara's "Funghi parasite delle piante coltivate," fase XV, No. 355. The general appearance of the European specimen resembles closely that of the Indian Castor Rust, but unfortunately there was not enough of the European material to allow me to study it under the microscope. This description is rather incomplete as are also the other references to this fungus mentioned above. The rust was first recorded for India in the "Annales Mycologici" in Sydow and Butler's "Fungi Indiæ Orientalis" under the name *Melampsora ricini* in 1906. But no description or figure is given.

So far only the *Uredo* stage is known, although search has been made for other stages during two years. The generic name of the fungus, therefore,

*The historical information contained in the 1st paragraph was kindly supplied to me by Dr. E. J. Butler, Imperial Mycologist, Pusa, India.

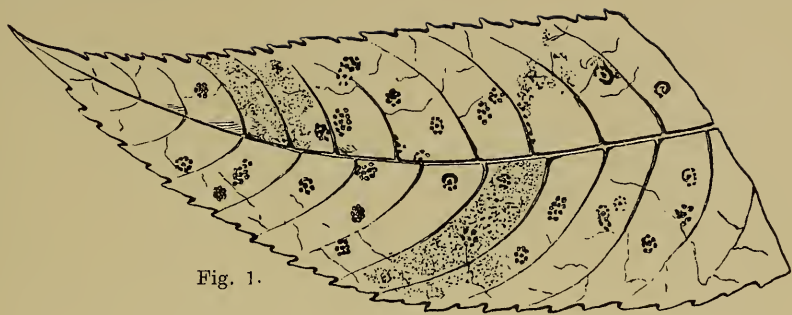


Fig. 1.



Fig. 2.

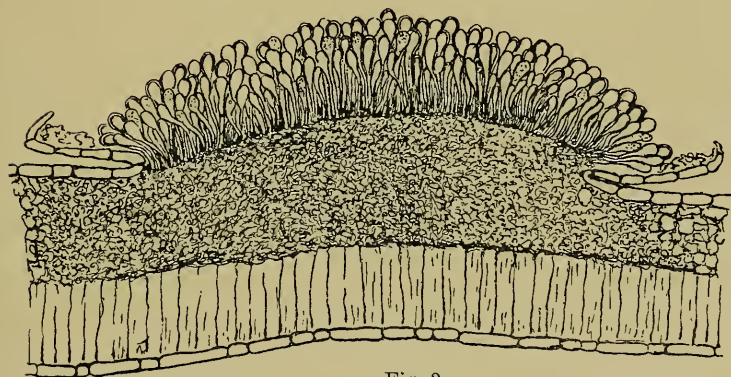


Fig. 3.

CASTOR RUST.

must still remain doubtful. It is thought desirable, in the meanwhile, to describe in detail the fungus as it occurs in the Indian specimens.

The rust is very common on the Castor plant in the Poona, Belgaum and Dharwar districts of the Bombay Presidency. It is remarkable that it is practically absent from Gujerat, though the varieties commonly grown there are by no means immune to this disease. Plants of all the common Gujerat varieties were grown for experimental purposes on the Poona Agricultural College Farm and these all got the rust.

This rust usually appears between the months of November and February on Castor sown in June as an annual crop. But it has been observed as early as September on some Castor plants more than a year old in the Ganeskhind Botanical Garden, Kirkee, and from the appearance of the leaves which were entirely covered with pustules, the rust had presumably been there all the summer. The attack is severest in January when practically every leaf of the plant is thickly covered with pustules, and clouds of spores are blown off from them on shaking the plant.

The orange yellow, powdery pustules (Uredosori) are confined to the leaf and occur chiefly on the lower surface, though very rarely they are met with on the upper surface also. They are indicated on the upper surface by minute roundish yellow spots. They occur in large numbers and not infrequently show an arrangement in concentric rings (Fig. 1), and they often run together. In severe cases this arrangement in rings is lost and the entire surface is covered thickly with pustules.

A transverse section of the leaf through a young pustule shows that the Uredo spores are first covered entirely by a peridium consisting of fungus tissue of polygonal cells. (Fig. 2). When mature they become exposed by rupture both of epidermis and peridium, which latter can still be seen as a layer underlying the epidermis. (Fig. 3). The spongy parenchyma below the epidermis is more or less completely occupied by the hyphæ of the fungus which form a sort of a cushion on which the spore-bearing hyphæ arise. The spore-bearing hyphæ separated by manipulation present a characteristic appearance. They are curiously branched and, as a rule, only two of these branches bear spores, the oldest spore being always at the top. (Fig. 4). The other branches are slender, pointed and sterile. Further the Uredo spore bearing hyphæ are intermixed with stout, club-shaped, paraphyses, generally colourless but occasionally the swollen heads showing orange colour. (Fig. 5 *a* & *b*). In the last case the paraphyses are easily distinguishable from the spore-bearing hyphæ by the perfectly smooth outline of their swollen heads. In mature sori the paraphyses generally project beyond the level of the spores.

The Uredo spores are globular or elliptical, echinulate and with orange contents. When examined fresh in distilled water it is possible to distinguish between two kinds of Uredo spores, one with thick walls and the

other with thin walls. (Fig. 6). There are no gradations between them. This observation recalls a similar one recorded for *Melampsorella aspidiotus* in Engler and Prantl's *Natürlichen Pflanzenfamilien I-Teil I-Abteilung*, p. 45. It was at first believed that these really represented two distinct kinds of *Uredo* spores and that the thicker walled spores were of the nature of Amphispores, which, (according to Arthur quoted in McAlpine's "The rusts of Australia") "are developed in arid or subarid regions, being provided with thickened walls to enable them to withstand unfavourable conditions, just like a teleutospore." But further observations throw a considerable doubt on this matter. If the spores from leaves kept dry in the herbarium for a month or two are examined, the proportion of thick-walled spores to thin-walled ones appreciably increases, suggesting that the thin-walled spores may develop a thick wall later on under certain conditions. Again after treatment with lactic acid, the distinction between thin-walled and thick-walled spores practically disappeared, the thin walls swelling almost to the size of the thick walls. The difference in the appearance of the spores examined fresh is, however, so striking that it is considered worth recording.

The fresh spores germinate in distilled water, readily in the months of January and February. The germination is poor earlier in the season. The two kinds of spores germinate alike. (Fig. 7). More than one germ tube are generally protruded but only one grows out finally, the other becoming disorganised. The largest number of germ tubes observed is five, four being the commonest number. The largest number of germ spores observed is six.

The size of the spores varies from $25\text{--}29'' \times 19\text{--}25''$.

No other spore form has been observed so far. An *Aecidium* was found on some Brinjal plants growing in the neighbourhood of the Castor plants on the Agricultural College Farm, Poona. This has been identified, provisionally, with *Aecidium habunguensis* by Dr. Butler. A few inoculation experiments carried on with the *Aecidiospores* of this gave negative results and there is at present no clue to answer the question whether the rust on Castor has any other spore forms or whether it is one of those rust fungi whose life cycle is restricted to the *Uredo* stage.

DESCRIPTION OF FIGURES.

(Figures 1 and 3 are free hand drawings. The rest are drawn with Camera lucida.)

Fig. 1.—Portion of rusted leaf of *Ricinus communis*. Natural size.

Fig. 2.—Transverse section of leaf through a young sorus, showing peridium $\times 860$.

Fig. 3.—A mature sorus $\times 120$ about, showing ruptured epidermis and peridium.

Fig. 4.—A spore-bearing hypha separated by manipulation $\times 400$.

Fig. 5.—*Uredo*-spore-bearing hyphæ and paraphyses $\times 400$.

Fig. 6.—A thin-walled and a thick-walled spore $\times 500$.



Fig. 4.



Fig. 6.



Fig. 5b.



Fig. 5a.

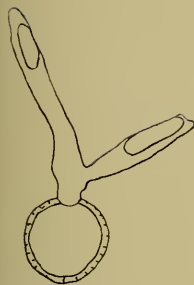


Fig. 7a.

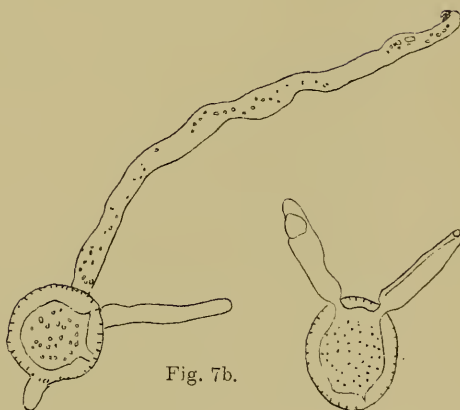


Fig. 7b.

Fig. 7.—Germinating Uredo spores (a) thin-walled (b) thick-walled $\times 500$.

S. L. AJREKAR, B.A.,

Assistant Professor of Mycology.

AGRICULTURAL COLLEGE,
POONA, January 1912.

NO. XXXIII.—NOTES ON CACTI IN NORTH-WEST INDIA.

A considerable number of plants belonging to the Cactaceæ are to be seen in cultivation in N.-W. India, and a few of them have obtained sufficient footing to deserve mention in local floras. The following plants as far as I have observed are firmly established and are capable of holding their own against, or even extending at the expense of the indigenous vegetation :—

Opuntia, Sp. No. 1.—About four feet in height, as a rule spineless, occasionally 1 (—3) spines in some of the tufts of bristles. Leaves $\frac{1}{3}$ in. long, conical, green or reddish. Joints dull, greyish-green, thick, very uniform in size, usually about 6 by $2\frac{1}{3}$ in. Flowers yellow.

The commonest species in the Plains of the Punjab between the Jhelum and the Sutlej, elsewhere it appears to be less common than other species.

Opuntia, Sp. No. 2.—About five feet in height. Spines in tufts of 4-6, the largest very stout awl-shaped, often somewhat curved, pale yellowish-brown with a horny appearance, $1\frac{1}{2}$ in. long, bristles numerous, conspicuous. Leaves pale green, conical, $\frac{1}{3}$ in. long from a broad base. Joints large, dull, bluish green, relatively not thick, usually about $\frac{1\frac{1}{2}}{6}$ by $\frac{6}{8}$ in. more or less undulate when looked at edgeways and at the margin. Flowers yellow. Found with the above but not quite so frequent. Planted in hedges in Rawalpindi.

Opuntia, Sp. No. 3.—About ten feet in height or even more. Very like Sp. No. 2 but spines slender, grey and opaque except when quite young, not curved. Leaves subulate, recurved, reddish at the tip, $\frac{1}{3}$ in. long. Joints not undulate, relatively rather thin. Flowers orange.

Common on the Ridge at Delhi and at and around Jaipur.

Opuntia, Sp. No. 4.—About six or eight feet in height. Spines at first one or several of which one is considerably larger than the rest, as the joints get older the number of spines in a tuft increases by the growth of fresh spines till in old stems as many as ten spines may be seen in each tuft. Leaves dark-brown, slightly recurved, $\frac{1}{4}$ in. long. Joints bright green, very variable in size and shape, narrow-oblong to broad obovate, usually 12 by $\frac{3}{4}$ in. sometimes $2\frac{1}{2}$ feet long and broad in proportion. Flowers yellow.

Widely distributed but not common in the Plains, the only species at all common in the Sub-Himalayan tract. Haripur, Abbottabad, Mansehra, Shinkiar, &c., in Hazara, in the Rawalpindi District not common, frequent throughout the Kangra District at suitable elevations, at many places in Hoshiarpur and Ambala Districts, Solon and Nirth in Simla District. In

the Plains at Jaipur, Phillaur, Amritsar, Lahore, &c., but less common than other species.

The question arises as to the identification of these species. The various local floras follow the Flora of British India and mention *Opuntia dillenii*, Haw. which cannot cover more than one of these species. An article has appeared in the Records of the Botanical Survey of India, Vol IV., No. 6., by Mr. Burkill called 'Determination of the Prickly Pears now wild in India,' in which the following species are mentioned for the area in question:—*O. monacantha*, *O. cochinelifera*, and *O. elatior*. Of these *O. cochinelifera* belonging to the sub-genus *Nopalea* I have not mentioned among the four species, which all belong to the sub-genus *Eu-Opuntia*, shortly described above, as I have not seen it except in gardens and hedges in Lahore where it is by no means frequent.

The article referred to does not give any description of the species dealt with, but the following key to the species of *Eu-Opuntia* is given:—

Spines falling except one long one on each cushion. *O. monacantha*.

Several large spines remaining on each cushion.

Spines all straight, slender, tawny or purplish-black:

Flowers orange.

O. nigricans.

Flowers at opening lemon yellow changing to rose-pink. *O. elatior*.

Spines some curved, the largest stout, light horn colored

in life, darkening in herbaria with age.

O. dillenii.

None of the species I mention would, according to this key, appear to be *O. monacantha*. No. 1 is, perhaps, the nearest, but in this species the spines do not 'fall leaving only one long one on each cushion,' because as a rule there are no spines at all. *O. monacantha* is referred to as a species on which the cochineal insect lives, and of my species No. 4. is the only one I have seen attacked. In 1906-07 I noticed the cochineal insect on species No. 4, throughout the Kangra District, almost every clump being attacked and in process of destruction. In 1909 I saw the same thing on the same species in the Hazara District, but in a more advanced stage. Here the remains of large clumps of *Opuntia* were common, the plants as a rule being quite dead, though here and there a few could be seen sprouting up from the root. Burkill mentions that *O. monacantha* has recently been used much for clothing hillocks in Lahore! Now the species used for this purpose is my No. 1, and on it the cochineal insect apparently will not live. When in the Kangra District I made a hedge of species No. 4 together with a few plants of No. 1, almost immediately after planting the former was attacked by the cochineal insect, whereas the latter escaped completely. It is I think evident that Burkill's *O. monacantha* refers to two species. Species No. 2 according to the key would appear to be *O. dillenii*, and No. 3 *O. nigricans*.

I have endeavored to identify the *Opuntias* I have mentioned with the help

of Schumann's 'Gesamtbeschreibung der Kakteen,' which is I believe the standard work on the subject. Species No. 1 is, I believe, *O. ficus indica*, Mill., or a closely allied species. Species No. 2 is *O. tuna*, Mill. (Schumann gives *O. dillenii*, Haw. as a synonym). Species No. 3 is very close to *O. nigricans*, Haw., if it is not that species. Schumann remarks that *O. nigricans*, Haw. is related to *O. tuna*, which is certainly true of my No. 3, but Schumann says the flowers of *O. nigricans*, Haw. are yellow. Burkill says the flowers of his *O. nigricans* are orange and that *O. elatior*, differs from *O. nigricans* in the flower being lemon yellow at opening, he identifies the Opuntia at Delhi and Jaipur as *O. elatior*. I agree that the Opuntia at Delhi is the same as the one at Jaipur, I have not seen the flowers of the former place but I saw them at the beginning of the flowering season in Jaipur, and whether just open or still in bud the petals were orange and hence according to the key this Opuntia is *O. nigricans*. The most obvious explanation of the confusion seems to be that *O. elatior* and *O. nigricans* are really one species, the flowers of which are either yellow or orange. Species No. 4 is *O. monacantha*, Haw. Burkill mentions one species of *Cereus* in his article, viz., *C. pterogonus*, though he does not record it from any place in N.-W. India. There is a large columnar Cactus in this region, it is used by villagers for fencing their fields in and around Anandpur, District Ambala, I have not seen it elsewhere except in gardens. This Cactus is not *Cereus pterogonus*, Lem. it is probably *Cereus peruvianus*, Mill.

The spreading of Opuntias is interesting to study, the fruits ripen of all the species I have mentioned, those of No. 1 in abundance, and they are eaten to some extent by birds, yet birds have little or no share in the spreading of the plants at any rate in N.-W. India. In the plains I have never seen young Opuntias springing up to any distance from old clumps such as one would expect if they were spread by birds. During nearly two years' residence in the Kangra District I took every opportunity to examine young *Opuntia monacantha* plants and with one possible exception found none of the young plants had arisen from seed. They are spread mainly if not entirely by cuttings either planted in hedges by man or by joints broken off by wind or cattle, taking root as they lie on the ground. On steep ground Opuntias spread fairly rapidly down hill and joints are sometimes transported by water and may be found rooting on banks of streams where they have been deposited by floods. In the case of species No. 1, and *O. monacantha* the whole fruit after dropping off may take root in the same way as a joint, in fact occasionally they do not fall off the mother plant but sprout and grow just as a joint would. Except in these two species I have not observed the rooting of the whole fruit, but it may perhaps occur with all the species.

R. N. PARKER,

D. C. Forests.

LAHORE, 23rd May 1912.

No. XXXIV.—A BRANCHING PALMYRA PALM (*BORASSUS FLABELLIFER*).

The accompanying photograph (taken by Mr. E. L. Richardson of the S. I. R.) is of a rather remarkable Palmyra palm which is growing in the neighbourhood of Tanjore. The tree at present has eight separate heads, and must at one time have had several more, as the stumps can be clearly seen.



MADRAS, 15th December 1911.

R. F. STONEY.

No. XXXV.—RATE OF GROWTH OF A DHAMAN (*ZAMENIS MUCOSUS*) HATCHLING.

On the 15th September I received a clutch of 22 dhaman eggs. Some of these were opened and found to contain fully formed embryos measuring 15.5 inches. Ten eggs were placed in wet straw and allowed to hatch out. Of these, three hatched on the 20th September, one on the 21st, three on the 25th and two on the 28th. One egg did not hatch, but when opened contained a fully formed dead embryo. One of the snakes that emerged on the 20th measured 16.1 inches, while one that hatched on the 28th measured 16.5 inches.

Accounts of the hatching of dhaman eggs and observations on the egg tooth have already appeared in the Journal (Vol. XVII, page 1033); so my intentions were to ascertain the rate at which a hatchling grew and the periods at which it sloughed; but as my subject only lived for a very short period, I give my results for what they are worth.

A hatchling of the 28th, which measured 16.5 inches, was tempted with frogs and lizards, but it refused to eat; nevertheless small frogs and agamoids were carefully thrust down its throat, and by this means I was able to keep it alive for over a month. In all it ate three young agamoids and thirty-six small frogs, and one day, when no frogs were available, some flesh of a rat was administered in small quantities. After two weeks it measured 18 inches and after a month 19 inches, that is to say, in confinement it had grown $2\frac{1}{2}$ inches in a month. It died after the fifth week, but during the fifth week it did not seem to have grown at all. It sloughed on the 5th October, *i.e.*, about a week after leaving the egg, and it showed signs of sloughing a second time on the 25th October, for in handling, the epidermis of the anterior half of the body came away in one piece.

E. A. D'ABREU, F.Z.S.

NAGPUR, C.P., February 1912.

No. XXXVI.—THE RUPTURE OF THE EGG-SHELL IN THE
GENUS CALOTES.

Before reading Capt. Venning's interesting note on the hatching of *Calotes jerdoni* in the last Number of the Society's Journal, I had sent to "*Spolia Zeylanica*" one on the same phenomenon in *Calotes nigrilabris*. So far as the external appearance of the egg just before the young lizard emerges is concerned, my observations agree closely with Capt. Venning's; but I can find no trace of an egg-tooth in my specimens, and indeed, it is hard to see how a structure of that nature could produce the oblique parallel slits and triangular flap so clearly shown in his figures. My own opinion is that the slits are produced by the long claws of the forefoot.

The manner in which the embryo is packed in the egg and also the nature of the cuts strongly favours this view.

N. ANNANDALE.

INDIAN MUSEUM, CALCUTTA.

May 14th, 1912.

No. XXXVII.—CHINESE GOLD FISH—*CARASSIUS AURATUS*.

I obtained 19 of these gold fish on January 27th, 1912, in the Old Chinese City of Shanghai, where they are bred in large earthenware pans by the Chinese for sale, each pan containing fish of different shapes, sizes and colours, very dirty water and water weeds and they are fed on water insects and rice. In all the gardens of the Chinese houses these fish are kept in little ponds or jars with rocks and ferns round and made pets of by the family, the more ugly the fish the better they are prized and looked after. The various forms are obtained by taking the eggs of the single-tailed variety and shaking or disturbing them, unnatural developments take place and fish with double tails, bulging or goggle eyes, eyes on top of the head-tufted fins and tails, no dorsal fins, &c., are the result; these, if carefully selected, will breed the same kind again.

When the female spawns, the eggs are removed from the big pan to a smaller bowl, as the males eat the eggs; they are then hatched by the heat of the sun. The young fish are nearly black, but gradually become white or red, and later gold, silver or black fish; some attain the large size of 2 feet and live to a great age, and a few of these may be seen in the Chinese public gardens of the old city. Chinese gold fish were first brought from Lake Tsau in the Province of Ngan-Kwin, China.

I placed the 19 fish in two large earthenware jars filled with the dirty water and weeds, with enough water insects for 10 days, food and brought them on board keeping them in a bathroom. On the 3rd day out from Shanghai, I changed them into a marble bath, as the temperature was getting high and the big fish looked sick, giving them fresh cold water which I then changed daily. On February 6th, the first big fish died; February 7th, 4 died; February 8th, 4 more died and February 9th, 1 died, I then removed the 9 back to the earthenware jars and gave up hopes of getting any to Bombay; but from that day to the time of writing, Feb. 14, no more have died. I feel sure that the cause of death was the heat after coming from dead winter and large fish were too fat.

I have two gold fish in my cabin, which I bought in the same place three years ago, and they are quite well and lively, but they have not grown at all.

P. & O. "ARCADIA,"

F. H. S. STONE.

BOMBAY HARBOUR, January 1912.

No. XXXVIII.—HORSE-MACKEREL ATTACKING JELLY FISH.

In the book entitled "The Story of Life in the Seas" by S. J. Hickson, F.R.S., page 100, he mentions that it is very probable that none of the Fish will feed upon a transparent Jelly fish. Whilst the P. & O. S.S. "Arcadia," was moored in the Inner Harbour of Aden last March, and on a very calm day, I and several of the other officers saw the following.

A large number of purple Jelly fish were round the ship and on the surface, each one about one foot across the back and all with very long tentacles; suddenly a small shoal of Horse-mackerel (*Caranx* sp.) dashed at one of these Jelly fish and began tearing and biting off the tentacles and apparently eating them; the Jelly fish could do nothing and was turned over and until at last there was nothing left but the upper part of the belly (body); then this shoal made for and attacked another in the same way. whilst other shoals were killing three more Jelly fish. The Horse-mackerel were only about 6 inches long, and our native crew caught quite a number of them. It is strange, as I believe the Jelly fish is quite a foster mother to very young Horse-mackerel, dozens of them are to be seen swimming about the tentacles of large Jelly fish, where they seem to get for protection.

F. H. S. STONE.

P. & O. S.S. "ARCADIA,"
HONG-KONG, CHINA, *February* 1912.

PROCEEDINGS

OF THE MEETING HELD ON 14TH MARCH 1912.

A MEETING of the members of the Bombay Natural History Society took place on Thursday, 14th March 1912, at the Society's Rooms, Mr. John Wallace, C.E., presiding.

NEW MEMBERS.

The election of the following 24 new members since the last meeting was duly announced :—

Lt. G. H. A. Pearson (Jullundur, Punjab); Mr. R. W. L. Dunlop (Bombay); Mr. H. N. Randle (Benares); Capt. J. F. C. Carter (Bassein, L. Burma); Mr. G. Somerville (Bassein, L. Burma); Mr. G. A. Levett-Yeats (Ghazipur); Mr. E. O. Bloch (Rangoon); Mr. H. M. Chibber, M.A. (Poona); Major G. P. Evans (Malakhand); Capt. W. J. Massy (Myitkyina, U. Burma); Mr. H. B. Player (England); Mr. P. S. Quarry (Jessore, Bengal); Mr. C. W. Skinner (Dehra Dun, U. P.); Mr. A. C. Rumboll (Bombay); Mr. J. R. Phillips (Insein, Burma); Mr. J. C. C. Wilson (Papun, Burma); Mr. F. Boxwell (Cachar, Assam); Mr. O. H. Walters (Rawalpindi); Capt. J. A. Scarlett, R.H.A. (Transvaal); Mr. V. N. Ffolliot Powell (Beawar); H. E. Lord Carmichael, G.C.I.E., K.C.M.G. (Madras); the Marquis of Bute (Edinburgh, Scotland); Mr. C. E. Aitken, P. W. D. (Mirpurkhas) and Dr. P. V. Casling, I.S.M.D. (Rawalpindi).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting :—

Contributions.	Locality.	Donor.
1 Tiger (<i>Felis tigris</i>) skull ..	Mishmi Country ..	Mr. W. J. H. Ballantine.
1 Golden Cat (<i>Felis temmincki</i>) Skin.	Akyab, U. Burma.	Commander Willock, R.I.M.
1 Large Indian Civet (<i>Viverra zibetha</i>) Skin.	Bhamo District ..	Major W. B. T. Abbeey.
3 Skins of Wild Dogs (<i>Cuon dukhunensis</i>) puppies.	Sangor, C. P. ..	Mr. D. O. Witt, I.F.S.
1 Giant Squirrel (<i>Ratufa gigantea</i>).	Abor Country ..	Mr. G. M. McCleverty.
1 Pallas's Squirrel (<i>Sciurus erythraeus</i>) and Stevens's Squirrel (<i>Sciurus stercens</i>).	„ „ ..	Do.
Head and foetus of large brown Flying-Squirrel (<i>Pteromys candidulus</i>).	„ „ ..	Dr. J. N. Faulkner.

Contributions.	Locality.	Donor.
1 Burmese Mole Rat (<i>Gunnomys varius</i>).	Rangoon	Dr. H. Marshall.
1 Painted Bat (<i>Kerivoula picta</i>). ..	Colombo	Mr. F. H. Stone.
6 Bats in Spirit	Ratnagiri	Mr. G. S. Hardy, I.C.S.
6 Pairs of Takin Horns (<i>Budorcas taxicolor</i>).	Mishmi Country..	Mr. W. J. H. Ballantine.
17 Bird Skins	" " ..	Captain F. Bailey.
13 Bird Skins	Hasimara, Duars..	Mr. H. V. O'Donnel.
1 Wall Creeper (<i>Tichodroma muraria</i>).	Raipur, Kangra..	Mr. Lionel Donaldson.
1 Red Turtle-Dove (<i>Aenopopelia tranquebarica</i>).	Meerpur, Champa- ram.	Mr. M. Mackenzie.
1 Great White belied Heron (<i>Ardea insignis</i>).	Hasimars, Duars..	Mr. H. V. O'Donnel.
Grey Lag Goose (<i>Anser cinereus</i>).	Munchar Lake, Sind.	Mr. P. M. D. Sanderson.
Comb Duck (<i>Sarcidiornis melanotus</i>).	Sunjval, Sind. ..	Mr. R. L. McCulloch.
Baikal Teal (<i>Nettion formosum</i>). ..	Dibrugarh, Assam.	Mr. Evan E. Evans.
" " " (<i>Gallinago stenura</i> semialbino).	Sibsagar, Assam..	Mr. F. W. Gore.
Pintal Snipe (<i>Gallinago stenura</i> semialbino).	Calcutta.. ..	The Hon. Mr Justice Chitty.
Jack Snipe (<i>Gallinago gallinula</i>) dark variety.	Thar and Pakar..	Mr. E. Priestley.
Johns Earth Snake (<i>Eryx johanni</i>).	Lucknow.. ..	Major J. H. Hudson.
Russell's Earth Snake (<i>Eryx conicus</i>).	Santa Cruz	Mr. R. W. L. Dunlop.
1 Green Whip Snake (<i>Dryophis mycterizans</i>).	Colombo	} Mr. F. H. Stone.
1 Buff Striped Keelback (<i>Tropodonotus stolatus</i>).	Colombo	
1 Snake (<i>Helicops schistosus</i>). ..	Colombo	
1 Snake (<i>Zamenia fasciolatus</i>), and two Sea Snakes.	Persian Gulf ..	Captain F. W. Townsend.
1 Cobra (<i>Naia tripudians</i>). ..	Andheri	Col. K. R. Kirtikar, I.M.S. (Retd.)
1 Snake and a Lizard	Anamally Hills ..	Mr. T. Bainbrigge Fletcher.
2 Lizards (<i>Calotes ophiomachus</i>) (alive)	Colombo'	Mr. F. H. Stone.
1 Chameleon (<i>Chamæleon calcaratus</i>)	Jholwad	Mr. A. M. D'Cruz.
6 Ceylonese monitors	Colombo	} Mr. F. H. Stone.
9 Gold Fish (<i>Carassius auratus</i>) alive.	Shanghai.. ..	
4 Fishes & 2 Crustaceans ..	Persian Gulf ..	Captain F. W. Townsend.

Contributions.	Locality.	Donor.
2 King Crabs and some Oysters, etc.	Various	} Mr. F. H. Stone.
80 Moths and Butterflies.. ..	Various	
20 Pieces of Coral.. ..	Singapore	} Mr. J. H. Smith.
150 Fossils	Bhuj, Cutch	

Minor contributions from:—Mr. T. Bainbrigge Fletcher, Mr. A. Gover, Capt. C. Thornhill and Mr. G. Arnold.

ADDITIONS TO THE LIBRARY.

Zoogeography Physical Atlas, 1911.. (Barthelomew, Clarke and Grimshaw).
 Birds of Uganda (Van Someren).
 Unexplored Spain (Abel Chapman and Walter J. Buck).
 My life among the wild birds in
 Spain (Willoughby).
 By Mountain, Lake and Plain .. (Major R. L. Kennion).
 Thirteen years among the wild beasts
 of India (G. P. Sanderson).

ACCOUNTS FOR 1911.

Mr. L. H. Savile, the Honorary Treasurer, in submitting a statement of the accounts for the year ending 31st December 1911, said:—I beg to call attention to the fact that the opening balance at the beginning of the year was Rs. 2,960-10-11, and the closing balance was Rs. 2,494-7-9, showing an excess of expenditure over income of Rs. 466-3-2. Although this is not a very large deficit, when compared with last year, which showed a surplus of Rs. 8,485-9-3 it is a serious falling off. With regard to the receipts which are Rs. 3,037-3-4 less than in 1910, the subscriptions are Rs. 600-0-1 less, entrance fees Rs. 1,079-4 less and sale of Duck Book Rs. 2,424-12-6 less. This latter source of income was practically expected to cease this year as the issue was nearly all sold last year, but what is more serious is the reduction in the amount of entrance fees, meaning as it does that the number of new members joining has decreased by 118. While the receipts have diminished, the expenditure has gone up by Rs. 4,945-15-10 as compared with last year, the principal items of increase being rent for the additional rooms taken over Rs. 750, salaries of staff Rs. 1,131-10-10, Journal account Rs. 3,302-8-3. These increased expenses are all very necessary if the Society is to carry on the work it has undertaken and the way in which members can best assist in helping on this work is to induce others to join the Society or in agreeing to a substantial increase of the annual subscription.

A separate account has been opened during this year to deal with the finances of the MAMMAL FUND which has been started for the purpose of making a mammal survey of India. The amount subscribed to this fund up to 31st December 1911 was Rs. 23,530-1, the expenditure to the same date being Rs. 7,786-15, showing the balance in hand of Rs. 15,743-2. Two collectors are now working on the collection of mammals for this survey, and provided funds are forthcoming, they will continue until a survey of the whole of India and Burma has been completed. The expenses of the two collectors amount to about Rs. 750 per mensem.

ELECTION OF THE COMMITTEE.

The following gentlemen were elected as office bearers for the present year:—*President*: H. E. the Right Hon'ble Sir George Sydenham Clarke, G.C.M.G., G.C.I.E., F.R.S.; *Vice-Presidents*: Mr. J. D. Inverarity, B.A., LL.B., Rev. Fr. Dreckmann, S.J., and the Hon. Mr. Justice N. C. Macleod; *Hony. Secy.*: Mr. W. S. Millard; *Honorary Treasurer*: Mr. L. H. Savile; *Honorary Librarian*: Mr. P. M. D. Sanderson; *Managing Committee*: Mr. E. C. Stuart Baker, F.Z.S., Mr. T. R. Bell, I.F.S., Mr. C. L. Burns, Mr. Wm. Burns, Mr. E. Comber, F.Z.S., Lt-Col. G. H. Evans, F.L.S., C.I.E., Capt. W. H. Evans, R.E., Prof. G. A. Gammie, Mr. E. Ernest Green, F.E.S., Mr. N. B. Kinnear, Lt-Col. K. R. Kirtikar, I.M.S. (Retd.), Mr. H. Maxwell Lefroy, M.A., F.E.S., F.Z.S., Major W. G. Liston, I.M.S., Mr. J. McNeill, I.C.S., Dr. A. Powell, Mr. G. M. Ryan, I.F.S., Major F. Wall, I.M.S., C.M.Z.S., Mr. John Wallace, C.E. and Mr. T. Bainbridge Fletcher.

The members and their friends spent the evening in the Museum examining the Society's collections. Among the exhibits were 155 skins of mammals which had just been received from Mr. G. C. Shortridge (the Society's Collector), from the South Dharwar District. These specimens were being forwarded to the British Museum for identification and return.

EXHIBITS.

Mrs. W. H. Deakin exhibited a collection of marine shells made by her in Back Bay, Bombay, and also some beautiful paintings of flowers. Mr. C. D. Mahaluxmivala, Superintendent, Victoria Gardens, exhibited 3 orchids in flower—*Dendrobium parishii*, *ochreatum* and *gratissimum*.

OF THE MEETING HELD ON 9TH APRIL 1912.

An "At Home" of the members of the Bombay Natural History Society took place on Tuesday evening, 9th April 1912, Rev. F. Dreckmann, S. J., presiding.

NEW MEMBERS.

The election of the following 11 new members since the last meeting was announced:—Mr. M. F. Delaney, Bombay; The Secretary, Rawalpindi Club, Rawalpindi; Mr. J. D. Way, Nowrangpur, Vizagapatam District; Lt. H. E. Shortt, I.M.S., Benares; Mr. John Stewart, Travancore; Mr. V. A. Mendoza, Bombay; Mr. J. E. Webb, Bilaspur, C.P.; Mr. E. Maconochie, I.C.S., Dharwar; The Inspector of Schools, Surma Valley and Hill Districts, Silchar, Assam; Mr. G. A. Laughton, Uran, Kolaba District; and Mr. W. P. Appleford, Gilgit, Kashmir.

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting:—

Contributions.	Locality.	Donor.
1 Skin Domestic Cat (<i>Felis domestica</i>) yellow variety.	Ahmednagar ..	Lt.-Col. J. Girvin, R.A.M.C.
3 Bats (in spirit)	Ratnagiri ..	Mr. G. S. Hardy, I.C.S.
1 Hare (<i>Lepus ruficaudatus</i>) skin	Aibheel, Assam ..	Mr. W. P. Field.
8 Bird skins	Meerut	Mr. H. C. Jeddere Fisher.
3 Do. do.	Thayemyo, Burma.	Mr. J. P. Cook.
26 Eggs of 6 species of birds ..	Kashmir ..	Mr. H. C. Jeddere Fisher.
1 Common Snipe (<i>Gallinago caelestis</i>).	Tonk, N. W. F. P.	Mr. C. R. Pitman.
3 Eggs of common Sandgrouse (<i>Pteroclorus exustus</i>).	Khandwa, C. P. . .	Mr. C. H. Dracott.
1 Lizard and 4 toads	Palni Hills ..	Mr. C. E. C. Fischer
43 Butterflies and Moths ..	Various ..	Mr. H. C. Jeddere Fisher.
115 Butterflies	Nilgiris ..	Captain G. Hare.

Minor contributions from Captain H. Thornhill, Mr. W. D. Cumming and Mr. J. Florence.

EXHIBITS.

No fewer than 265 specimens of mammals from the Central Provinces collected by the Society's Collector (Mr. C. A. Crump), and a number of specimens of mammals from the S. W. Dharwar and East Kanara Districts (collected by Mr. G. C. Shortridge) were exhibited and admired. These specimens were being forwarded to the British Museum for identification and return.

MAMMAL SURVEY.

The Secretary announced that he had just received an intimation that the Royal Society had been good enough to sanction a grant of £25 towards the survey of the Mammalian fauna of India, Burma and Ceylon organized by the Society. The Government of Madras had also kindly promised the sum of Rs. 2,500 towards this survey. It had been found that the area to be covered was so enormous that the survey would, with only two collectors, take much longer than was at first estimated and it became necessary therefore to obtain a further Rs. 30,000 or Rs. 40,000 in order that the survey might be thoroughly carried out, and it was hoped that members and others would send in subscriptions to enable the Society to accomplish this scientific work.

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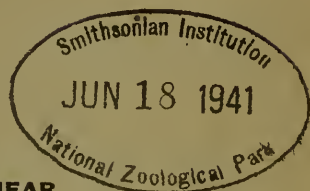
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THE GAME BIRDS OF INDIA,
BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART VIII.

With Plate VIII.

(Continued from page 739 of this Volume.)

SYPHEOTIS BENGALENSIS.

The Bengal Florican.

Otis bengalensis.—Gm. Syst. Nat. i, p. 724 (1788); Hodgson, J. A. S. B., xvi, p. 883.

Otis delicosa.—Gray and Hardw., Ill. Ind. Zool., i, pp. 61 and 62.

Sypheotides bengalensis.—Blyth, Cat. B. Mus. As. Soc., p. 258; Jerdon, B. of Ind. iii, p. 616; Godwin Austin, J. A. S. B. xiv, part II, p. 84.

Sypheotis bengalensis.—Hume, Nests and Eggs, p. 559; *id.*, Hume and Marsh., Game B. i, p. 23, iii, p. 424; Hume, Cat. No. 838, Str. Feath. viii, p. 111; *ibid.*, ix, p. 199; Markham, *ibid.*; Fasson, *ibid.*, p. 200; Butler, *ibid.*, x, p. 162; Hume and Cripps, *ibid.*, xi, p. 312; Oates in Hume's Nest and Eggs, 2nd Edit. iii.

p. 378; Finn, Indian Waders, p. 123; Inglis, Journal B. N. H. Soc. xiv, p. 766; *id.*, *ibid.*, xvi, p. 73; Wall, *ibid.*, xvi, p. 388; Stuart Baker, *ibid.*, xvii, p. 538.

Houbaropsis bengalensis.—Sharpe, Cat. B. M. xxiii, p. 315; *id.*, Hand L. i, p. 175; Oates, Cat. Eggs. B. M. i, p. 88; *id.* Game B. of Ind. i, p. 414.

Vernacular Names.—Charas, Chars, Charat, *H*; Dahar, Ablak ♂ Bor ♀, *Terai*; Ulamora, *Assamese*; Dao-tiriling, *Cachari*.

Description, Adult male.—Whole head, neck and lower parts very glossy black, in some lights shewing a distinct blue or purplish sheen, more especially on the feathers of the breast and crest. Back black, each feather with two broad bars of buff mottled with black, the general appearance of the back being thus a mottled black and buff, the former predominating. The bases of the feathers are black and in quite freshly plumaged birds there is a narrow buff fringe to the tips of the feathers, which, however, soon gets abraded off so that the tips generally appear black. Inner scapulars like the back, but the mottlings are even more irregular, the centres to the feathers are chiefly black and the surrounding portions vermiculated buff and black. Tail, four centre feathers like the back, but the outermost are entirely black with narrow white tips and the intermediate feathers grade from one to the other. Outer scapulars black, a few of the feathers more or less mottled with buff, on the inner webs, inner secondaries like the back, but with numerous bars of black, not always the same in number; remaining quills white, except the outer webs and part of the inner webs of the first and second primary, which are black; in some birds the outer web of the third primary is also nearly all black and this black diminishes in extent on each succeeding quill, remaining only as a black tip to the outer webs of the innermost primaries and disappearing altogether on the outer secondaries. The shafts of all the wing quills are black.

Bill, upper mandible dark brown, sometimes with a leaden tinge, lower mandible paler and more leaden and often with a yellow tinge on the basal two-thirds. Iris brown, Hume says sometimes yellow. Legs straw yellow, sometimes with a tinge of green or plumbeous.

Wing 13·2" to 13·75"; bill, from feathers above nostril on culmen, 1·2" to 1·25", from gape 2·12" to 2·44"; tarsus about 5" or a little over; tail 6·5" to 7·25".

Tarsus 5·6" (Blanford).

Tarsus 6·12" to 6·75" (Hume).

The feathers of the crest are long and somewhat lanceolate and measure from 3" to 4" or even more. The feathers of the hind neck average about 2" and below the neck they increase gradually in length from the tiny feathers of the chin to feathers on the fore neck of over three inches and to the final tuft of feathers on the breast which may be as long as six inches in old, fully plumaged birds.

In some birds which are more than usually richly coloured there is often a rufescent shade in the buff colour on the upper parts.

Adult female and male in first plumage.—Crown, dark brown, sometimes almost black, with a certain amount of buff speckling and buff edges to the posterior feathers; a broad coronal streak of mottled brown and buff; supercilia and lores buff, generally immaculate but the former sometimes with a few dark specks; feathers of short crest buff speckled with black or brown and with dark centres and shafts. Chin, upper throat and centre of lower throat buff or sand colour unspotted, remainder of neck sandy buff freckled and narrowly barred with black or brown, the bars not being definite enough to make the neck look more than freckled. Down each side of the neck the feathers are centred with dark streaks, making two fairly definite lines which coalesce on the neck adjoining the breast, the feathers of this part seem often to be a richer shade of buff than elsewhere on the plumage. The back, scapulars and inner secondaries are black, mottled and freckled with buff except in the centre of each feather and with broad sub-edges of buff in a V. shape. On the secondaries and outer scapulars the markings are bolder and the black assumes the shape of fairly definite bars. Wing coverts pale buff with a rufous tint here and there and with sparse markings in the form of broken bars of black or deep brown, not numerous enough or regular enough to break the general contrast of these pale buff feathers with the plumage of the back. Remainder of wing quills

black, the outermost feather with a faint suggestion only of mottled bars of buff on the inner web, these increasing in extent until the whole of the inner secondaries are mottled black and buff. Rump like the back but less broken with buff; tail mottled black, or brown, and buff, the mottling decreasing in extent on the outer tail feathers which are fairly distinctly barred with broken black and buff. Upper breast and edge of flanks buff speckled with black or brown like the neck; flanks, where covered with wing, mottled with black; remainder of lower parts pale, sandy buff, often slightly darker on the under tail coverts which are sometimes speckled with dark brown.

Irides yellow, dingy to almost golden, bill like that of the male but paler and often fleshy towards the base of the lower mandible; legs dingy yellow or straw colour. Wing 13·2" to 14·50"; bill at front 1·50" to 1·54" and from gape 2·2" to 2·5"; tarsus 5·6" or over; tail 6·5" to 7·25".

The measurements given above for males and females, which are taken from a series of 14 males and 11 females, all fully adult, would seem to shew that the females are very little larger than the males, but this is not really the case as she is a far heavier and more bulky bird. I have two records of exceptionally heavy cocks, one shot by Mr. Mundy in Dibrugarh, Assam, and another by Mr. J. Harrison of the same district, which both weighed between $3\frac{1}{2}$ and $3\frac{3}{4}$ lbs. Most males, however, are less than 3 lbs. in weight, young cocks of the year seldom exceeding $2\frac{1}{2}$ lbs. Females, on the contrary run up to 5 lbs., a weight which has been recorded by Mr. A. Primrose and others; they often exceed 4 lbs. and even females of the first year seldom weigh less than $3\frac{1}{2}$ lbs.

Young male.—The young male is at first like the female and commences to assume the adult male plumage in the second year, that is in its first spring moult, but probably often reverts, more or less, to female plumage in its autumn moult, retaining, however, the white wing-coverts of the adult male.

The complete adult plumage of the male is assumed in the most irregular manner, and at the first spring moult the young cock bird may assume any portion of the adult plumage retaining elsewhere

that of the female. Nearly always, however, the white wing feathers are amongst the earliest to shew themselves.

Some young birds first moult into the adult black plumage from the breast downwards, having this part wholly glossy black, although, with the exception of the wings, the rest of the body remains clothed in female garb. Other young males retain their first feathering on the upper parts, but commence to assume the black feathers of the throat as well as that of the lower parts in a lesser degree. One such specimen I have examined has the whole of the upper part in juvenile plumage with the exception of a few white feathers amongst the wing-coverts; below, from the chin to the breast the black feathers are growing profusely, though there are still a few feathers here and there retaining their original vermiculated appearance; from the lower breast downwards the whole lower plumage is a soiled white, with a good many black feathers showing all over as well as a few vermiculated ones.

This young bird is a most interesting one as it would appear that sometimes, whilst the upper breast, neck, head and upper parts assume the adult plumage directly, though by varying degrees; the plumage of the lower parts goes through a transition stage. The whole of the buff in the bird has been replaced with white, though there are but few of the adult black feathers yet showing.

The question as to whether the Florican has a separate breeding plumage and changes back again during the autumn moult into a non-breeding, or post-nuptial plumage may, I think, be now decided to the contrary.

Blyth is responsible for the generally accepted theory that the cock-bird changed into a semi-female plumage in autumn which it regained the succeeding spring, and doubtless he had then a good deal of information before him on which to ground his arguments. Blyth writes "Mr. Hodgson is also certainly mistaken in his assertion that the nuptial dress is worn permanently, as we have witnessed the change before described and the subsequent partial removal of the breeding livery, which latter was not well developed in captivity, and have likewise observed the fact in the skins of wild birds." Hodgson, on the other hand, says "The

moult is two annually, one from March to May and the other autumnal, which is less complete and more speedily got over, between August and October. The young males, up to the beginning of March, entirely resemble the females, but the moult then commencing gradually assimilates them to the adults, which never lose, as the lesser species or Likh does, after the courting season, the striking black and white garb that in both species is proper to the male sex, and permanently so to the larger species after the first year of age. There is, properly speaking, no nuptial dress in this species, though the hackles and crest in their most entire fullness of dimensions may be in part regarded as such."

Now this statement of Hodgson's seems to be entirely correct, except as regards one important particular. He considers, as we have seen, that the Bustard assumes adult plumage in two moults, or even in one, and that after the *first* year the young bird retains permanently its adult colouration; I would change first year to second year.

We know now that just as many fully plumaged adult males are seen during the cold weather, say from November to the end of February as at any other time of the year. I have seen magnificent specimens of cocks moulting in April from adult plumage to adult plumage. But, on the other hand, I have several times seen *non-adult* cock-birds, which were in an intermediate stage remoulting in autumn and shewing some new feathers coloured as in the female. From this we may, I think, infer that it takes the young cock at least two years before it assumes the full plumage of the breeding cock. It will be seen that Blyth does not say that his Bustard, after having a retrograde moult, then moulted in the succeeding moult into full feathering, but he puts down this failure to assume the fully adult garb to the effects of captivity. The facts, in reference to the assumption of the fully adult plumage, appear to be these. In the autumn moult of its first year the young male bird retains its female plumage, but in the succeeding spring moult acquires a colouration intermediate between the two sexes. The autumn moult of the second year may often see the young cock lose a certain amount of the colouring he had gained in the spring, but at the next spring moult he goes further still

towards the plumage of the adult, and on the completion of this moult, when he is just under two years old, he either obtains the adult plumage in full or else he does so at the second yearly moult in the autumn. From this time onwards there is no further retrograde step. Of course, I have seen very many cocks in the winter in either wholly female or half stage feathering but these have been small birds which, though they were sometimes very fat and in prime condition, never weighed more than 2 to $2\frac{1}{2}$ lbs. There is no doubt that a cock Florican takes at least two years to grow to his greatest size and weight, and it is but natural that his dress should keep pace with his growth and that he should not arrive at his full splendour of plumage until he also arrives at his full vigour and size.

Distribution.—Although so many years have passed since Hume described the habitat of the Florican, there is but little to add to his account; he says “The Bengal Florican is almost confined to Eastern Bengal, the valley of Assam, the Bhutan Dooars, and those portions of Bengal, Oudh and the North-Western Provinces lying North of the Ganges. Jerdon says that it spreads through the valley of the Jumna into Rajputana, the Cis-Sutlej States, and parts of the Punjab; but this is wrong. It is the Houbara that is found in these localities, not the Bengal Florican; but sportsmen constantly call the Houbara the Florican, and hence the mistake. I have never seen the true Florican anywhere west of the Kadar of the Ganges, except as a rare straggler in the Dun; and there again it does not, to the best of my belief, extend further than the Kadar of the Jumna. In Meerut I have killed both the Houbara and the Likh, but it is only when you get quite down into the Kadar of the Ganges at Hastinapur and Makhdumpur, or again southwards below Garhmuktesar, that you meet the true Florican, and here we used to pick up a few couples every cold season.

“This species has been recorded from Tipperah and Sylhet, but Captain Williamson tells me he has never seen it in the latter, and both he and Mr. Inglis say the same as regards Cachar.

“This Florican is essentially Indian, and extends so far as we know, nowhere beyond the limits of the empire. It is *possible*,

however, that it may hereafter be found to occur in the country immediately East of Assam. ”

To this, in a footnote, Hume adds that it is certainly to be found as far west as Nuddea.

Roughly speaking, this beautiful Bustard is confined to the grass land area North and East of the Ganges and on either side of the Brahmapootra ; outside of this it is but a straggler. My furthest record South-East is from the district of Chittagong, whilst in the Assam Valley it extends to the extreme Eastern limit of the grass lands and churs bordering the Dihong, Dibong and Brahmapootra Rivers running right up to the very foot of the Hills, both to East and North. It is found in the Terai in some numbers, wherever the country is suitable, and in the same way throughout the Dooars, South of Nepal and Bhutan. In Assam it is common in many districts and extends all through the Assam Valley from Rungpur and Goalpara to Dibrugarh. From the Surma Valley it is shut out by the Garo, Cachar and Khasia Hills, and though it is common in parts of Nowgong to the North of these ranges it is of extreme rarity anywhere to the South of them. I have shot three birds, all young females, in Cachar, and have seen two specimens from Sylhet. Hume records it from Tippera in 1902, and finally I have received a specimen from Chittagong. But these few instances are scattered over a period of over 25 years and merely emphasize the fact of their great rarity, South of the Brahmapootra Valley.

As Col. Graham gave such a detailed account of the numbers in which the Florican was to be found in former times in each Assam district, it may be as well here to give also an idea as to how they are now distributed. Col. Graham writes : “ The Bengal Florican may be said to extend throughout the Assam Valley, from the Manas River, on the West, to the Mishmi Hills, East of Sadiya, on the East.

“ It is found in greatest numbers in high and dry open lands, the places most frequented by it being the large Bishnath plain and the higher lands lying between the Government Trunk Road on the North of Brahmapootra, and the hills throughout the Darrang districts.

“ North of Mangaldai, in Darrang, about five miles from the

Bhutan Hills, at a staging bungalow, well named Shikar, I shot fourteen Florican in one day.

"The Florican is also found on the Sadiya plains in fair numbers, and on the chars of the Brahmapootras, but it is much scarcer on the South bank of that river.

"On the Bishnath plain and other places in the Darrang district I have seen, I am sure, from 30 to 40 Florican in a day.

"Taking Assam, as a whole, I should say of the Florican :

"In Darrang, very common.

"In Kamrup and Goalpara, a good sprinkling.

"In Nowgong, Sibsagar, Lakhimpur, here and there a fair sprinkling, but, as a rule, scarce. "

At the present day the Florican is still plentiful in the Goalpara district on the North bank, breeding in great numbers in the sun-grass lands at the foot of the Bhutan Hills; from this district it extends through Kamrup, Mangaldai, Darrang and Sibsagar. North of the Brahmapootra in considerable numbers wherever there are the necessary plains of grass to be found. In North Lakhimpur it becomes less common, though it will be found, as already mentioned, right up to the foot of the Abor, Mishmi and Daffa Hills, East and North of Sadiya. South of the Brahmapootra River, though it is common in parts of Nowgong, it is elsewhere rare. In Lakhimpur and Sibsagar a fair number are shot annually south of the River, but in Kamrup and Goalpara it is decidedly rare on that bank of the Brahmapootra and it hardly ever straggles to the district of Mymensingh, which adjoins the latter, though it is common in parts of the Rangpur district to the North of the River. I should, however, note that Farren recorded it as occurring not infrequently along the borders of the Madhapore jungle in 1880.

Both in Maldah and Purnea, where 25 years ago it was common, it has now become much less so, principally owing to the spread of cultivation and the consequent destruction of its favourite haunts. In Nuddea it is not now heard of and the last killed there was by myself, this too a female, in January 1884.

In Behar it only occurs as a very rare straggler. Inglis, who has worked this part of India very thoroughly, only records five instances of its occurrence, and, of these, two concern the same bird.

The favourite haunts of the Florican are thus well described by Hodgson, who says : “ Tarai is an Indian term equivalent to Pays Bas, Landes, Marches and Marshes, of European tongues ; and the name Tarai is applied, par excellence, to a low-lying moist and rarely redeemed tract of level waste, extending outside the Sal forest along the base of the sub-Himalayas from the debouch of the Ganges to the Brahmapootra. This tract of great extent and peculiar features, is the favourite habitat of the Florican, which avoids the mountains entirely, and almost, if not quite as entirely, the arid and cultivated plains of the Doab, and of the provinces West of the Jumna. It dwells indeed, upon plains exclusively, but never upon nude or cultivated plains. Shelter of nature’s furnishing is indispensable to it, and it solely inhabits wide-spreading plains, sufficiently elevated to be free from inundation, and sufficiently moist to yield a pretty copious crop of grasses, but grasses not so thick nor so high as to impede the movements or vision of a well-sized bird that is ever afoot and always sharply on the look-out. Such extensive, well-clad, yet uncultivated plains are, however, to be found only on the left bank of the Ganges and accordingly I believe that to that bank the Florican is nearly confined, and to the Tarai portion thereof.”

I am afraid, however, that since Hodgson’s days the Florican has become less wise, for he now-a-days often haunts grass land that is liable to inundation and indeed, throughout the cold weather, he is found on the plains bordering the rivers and on the islands in them, although during the rains these may form one vast sheet of water with the river itself.

The Florican prefers to frequent plains which are covered with thin grass, or thin grass combined with scattered scrub jungle, and much affects those tracts on which village buffalo feed and in which the grass is eaten down to some 18 inches or two feet, with here and there patches of higher grass, and others, again, bare altogether. In the same way they haunt the plains of ekra and grass after these have been burnt and the fresh crop has grown up to a foot or so but is still much mixed with the burnt and withered stems of the previous year’s growth. It is only in the height of the rains and when no other cover is available for them that

they will ever be found in the dense grass and ekra which at these times may grow to a height of 15 feet, nor will it even then be obtained in such unless there is no other more suitable ground within many miles. Of course, when repeatedly shot at, birds will temporarily take refuge in such cover and sometimes when they are much worried either by sportsmen or village pot hunters they will lie up in heavy cover during the heat of the day, coming out to feed in the mornings and evenings.

Mr. A. Primrose, who was for some years in Goalpara, in writing to me about the Florican says:—"It has a very decided predilection for certain spots, and if you kill the present occupant another is sure to be very shortly found in the same place; one such spot was the grazing ground of the Mornai Tea Estate and on this piece of land I must have accounted for fully a dozen birds and my predecessor for as many more."

"The birds, as a rule, in grass land, lie very close and rise generally well within shot and as they are not what I should call good shot carriers No. 6. shot will be found quite large enough to crumple them up. As a matter of fact I have killed two or three—all females if I remember rightly—with collecting cartridges only loaded with No. 9 or 10 shot. When, however, the bird is found in open or burnt patches it is exceedingly wary and very hard to get right within shot."

"The flight, when well on the wing, while not being rapid, is strong and direct."

I have occasionally shot them when out snipe shooting flushing them from small patches of grass between the rice fields, and No. 8 or 9 shot have always been enough to tumble them over, for though big birds their plumage is soft and lax and affords little protection.

When once flushed they generally fly a good distance, sometimes a mile or so, before alighting and are then difficult to find and to flush again, as they are great runners and move on a long distance before stopping.

Hodgson says:—"The Florican is seldom found in thick cover. When he is, he lies close, so that you may flush him at your foot; but in his ordinary haunts, amid the scattered tufts of more open

grass plats he can be neared with difficulty only, and No. 5 shot and a good heavy gun are required to bring him down at 40 to 60 yards distance. His flight is strong with a frequent rapid, even motion of the wings, and if he be at all alarmed, it is seldom suspended under 200 to 300 yards, whilst not unfrequently it is continued so as to carry the bird wholly out of sight and pursuit. When flying the neck is extended before the body, and the legs tucked up under it, whereas the whole family of the Herons fly with neck retracted over the back and legs stretched out behind. The walk of the Florican like that of the Heron, is firm and stately, easy and graceful : he can move afoot with much speed, and is habitually a great pedestrian, seldom using his powerful wings, except to escape from danger, or to go to and from his feeding ground at morn and eve, or to change it when he has exhausted a beat.

“ This species is silent and tranquil, and except in the breeding season, seldom utters a sound, but if startled its note is a shrill metallic chik, chik-chik, and the more ordinary note is the same, but softer and somewhat plaintive.”

Mr. Primrose endorses this and says that on being flushed it utters a sort of chirrup, but is otherwise silent. I have myself heard them give a sound when flushed, but should have described it rather as a croak than a chirrup : other than this and the curious humming they give when courting I have not heard them make any sound.

They are not gregarious as are most other Bustards, and one bird will seldom be found very close to another.

Col. Macgregor says that he once put up four Florican within a radius of 30 yards, but this is unusual and birds are seldom found within a couple of hundred yards of one another, especially where the jungle is thin and the birds can move about freely. Once when duck shooting I saw two old cock-birds in the open within a few yards of one another, and when I sent a man round to drive them overhead he also put up a hen and my companion and I accounted for all three. Once, also, I shot two hens out of a patch of grass not a hundred yards long, and once or twice I have taken two clutches of eggs laid quite close to one another.

Big bags of Florican are seldom made, though on one occasion a so-called sportsman in Assam shot 64 of these beautiful birds in one day, during the breeding season. There had been very early and very unusually heavy rains and in consequence a vast area of grass covered plain had become temporarily submerged and for miles in every direction there was water varying in depth from a few inches to two or three feet deep. In the centre of this was a somewhat raised strip, and here all the birds from far and near had collected. The sportsman (?) walked from one end to another, bagged a dozen Florican and then when the birds had again returned and settled on the dry land, walked back and killed a lot more and this he continued to do until darkness drove him home.

Mr. Anley, writing of the Dooars, said, that he had seen as many as twenty in a morning and Mr. Damant recorded that bags of eight or ten could often be bagged in a morning at the foot of the Garo Hills.

Col. Comber also says that in many places they are common enough in Assam for ten or more to be killed in a day's shoot.

With a line of elephants there are still many places where one could pick up a dozen birds or so in a day, but shooting on foot is laborious work, for much ground has to be covered and the grass and jungle make the walking hard. Under the latter circumstances a bag of more than four or five would be good nowadays for a single gun to get in a day's work.

It is not often, however, that a sportsman sets out to make a bag of Florican; many are killed by men out making a miscellaneous bag, but perhaps even more are killed by sportsmen on elephants returning from a day's big game shooting.

The breeding season of the Florican commences in March and extends into June, but the majority of eggs are laid in the first fortnight of April or in the last week of March.

The cock Florican, like all the rest of his family, goes in for all sorts of curious antics during the breeding season. Hodgson, as quoted by Hume, writes: "The Florican is neither polygamous nor monogamous nor migratory nor solitary. These birds dwell permanently and always breed in the districts they frequent, and

they dwell also socially but with a rigorous separation of the sexes, such as I fancy is paralleled in no other species. Four to eight are always found in the same vicinity, though seldom very close together, and the males are invariably and entirely apart from the females after they have grown up. Even in the season of love, the intercourse of the sexes amongst adults is quite transitory, and is conducted without any of that jealousy and pugnacity which so eminently distinguish most birds at that period.

“In the season of love, the troops of males and females come into the same neighbourhood, but without mixing. A male that is amorously disposed steps forth, and by a variety of very singular proceedings, quite analogous to human singing and dancing, recommends himself to the neighbouring bevy of females. He rises perpendicularly in the air, humming in a deep peculiar tone and flapping his wings. He lets himself sink after he has risen some fifteen or twenty yards; and again he rises and again falls in the same manner, and with the same strange utterance and thus perhaps five or six times, when one of the females steps forward and with her he commences a courtship in the manner of a Turkey cock, by trailing his wings and raising and spreading his tail, humming all the time as before.

“When thus, with what I must call song and dance, the rites of Hymen have been duly performed, the male retires to his company and the female to hers; nor is there any appearance (I have at some cost had the birds watched most closely) of further or more enduring intimacy between the sexes than that just recorded, nor any evidence that the male ever lends his aid to the female in the tasks of incubation and rearing the young.

“The procreative instinct having been satisfied, the female retires into deep grass cover, and there, at the root of a thick tuft of grass, with very little semblance of a nest, she deposits two eggs, never more or less, unless the first be destroyed. If the eggs be handled in her absence, she is sure to discover it and to destroy them herself. The eggs are of a size and shape of an ordinary domestic fowl’s but one generally larger and more richly coloured than the other.

“The female sits on her eggs about a month, and the young can follow her very soon after they chip the egg. In a month they are able to fly; and they remain with the mother for nearly a year, or till the procreative impulse again is felt by her, when she drives off the long since fully grown young. Two females commonly breed near each other whether for company or mutual aid and help; and thus the coveys,—so to speak, though they are not literally such,—are usually found to consist of four to six birds. The Florican breeds but once a year in June, July, that is, the eggs are then laid, and the young hatched in July, August.”

Capt. C. B. Macgregor also describes their dance as follows: “In June and July and sometimes as late as August, I have repeatedly witnessed the performance of the nuptial dance by the cock-bird in full plumage. The bird rises from the ground and hovers with extended wings from 10 to 20 feet in the air, and thus attracts the female birds who may be within an easy distance. Twice I have noticed this dance in the evening after the sun has gone down when returning from shooting under the Daphla Hills. The Florican generally breeds in the higher plateaux of the Assam Valley, near the foot of the hills. The males have been seen also by Major Cock in full plumage in the month of May.”

Mr. Primrose, also, in writing to me remarks: “The male bird makes itself very conspicuous during the breeding season from its habit of rising a few feet into the air above the grass and, after hovering a few seconds with quivering wings, again dropping to earth. Whilst thus employed the birds are so taken up with their performance that they are very easily approached and the native pot hunters take full advantage of them at this season.”

The first clutch of eggs I ever took with my own hands was found for me by a Mikir, and shown to me on the 3rd June 1904. These two eggs were laid in a bare patch in an extensive field of sun-grass close to a village, the cattle and buffaloes from which had regularly fed over it. In consequence, the grass was neither very high nor very dense and was intersected in every direction by small paths, worn by the animals as they fed. These were taken at Sadiya in the Dibrugarh District and I heard of two other

clutches being found by sportsmen in that district, one in March and the other in July.

In 1906 and the following years I employed a large number of men to work the Terai land at the foot of the Himalayas in the Goalpara and Mangaldai Districts and succeeded eventually in obtaining a very fine series of their eggs and in all over 60 have now passed through my hands.

The result of this work shows beyond all doubt that the normal breeding season of the Florican is much earlier than has hitherto been thought to be the case. The months in which the vast majority of eggs are laid are March and April and it may be said that the height of the laying season is from the 10th March to the 15th April. Some few birds will, however, be found to be laying in May and yet a few others as late as June, but in this latter case I fancy the clutches are second layings in place of others which have been taken or destroyed.

Messrs. Shillingford, Whymper and others have certainly taken their eggs in June, and the latter assures me that he believes that June is the normal laying month for Florican in the north-western Nepal Terai. All these people have however taken but a casual nest here and there, and I still consider the weight of evidence points to the Florican being an early breeder.

The following are the dates on which I have taken, or had taken, Florican's eggs:—

28th February, Two eggs, quite fresh.

3rd March One egg do.

6th „ Two eggs do.

7th „ Two pairs of eggs, fresh.

14th „ One pair, slightly incubated.

16th „ One egg, hard set (about 20 days).

19th „ Two pairs, one fresh, one hard set.

24th „ Two pairs, both fresh.

25th „ One pair, fresh.

29th „ Three pairs, two slightly incubated, one fresh.

30th „ One pair, slightly incubated.

3rd April, One pair, fresh.

5th „ One pair, fresh.

7th	April,	Two pairs, one slightly, the other much incubated.
9th	„	Two pairs, both considerably incubated.
10th	„	One pair, fresh.
11th	„	One pair, incubated.
13th	„	Three pairs, one considerably, the other two slightly incubated.
16th	„	Two pairs, hard set.
19th	„	One pair, would have hatched in three days or so.
23rd	„	A single egg, much incubated.
27th	„	Two pairs, slightly incubated.
29th	„	A single egg, fresh.
30th	„	A single egg, almost fresh.
5th	May,	A pair, fresh.
13th	„	A pair, hard set.
14th	„	A pair, hard set.
20th	„	Two pairs, one slightly, the other considerably incubated.
25th	„	A single egg, hard set.
31st	„	One pair, hard set.
3rd	June,	One pair, fresh.
5th	„	One pair, fresh.
16th	„	Two pairs, fresh.
24th	„	One pair, not taken away.
3rd	July,	Four eggs, close together, not taken.

Thus, of the 79 eggs recorded it will be seen that they were found as follows :—

In February,	2.
„ March,	22.
„ April,	31.
„ May,	13.
„ June,	8.
„ July,	4.

The four eggs seen in July were in some grass land which had been flooded and were actually under water when found, so that they must have been laid some time in the middle of June at latest. The gentleman who found them was after tiger at the time and did not remove them.

In every case the eggs had been laid on the ground in small bare patches in the centre of fields of sungrass, or *uloo* grass, these being generally of considerable extent, seldom near any village or habitation, and most often surrounded by dense forests or cane jungle.

The eggs are exceptionally difficult to find owing both to the great extent of country one has to cover and to the natural cuteness of the hen bird. Unless taken absolutely unawares by the searcher she never rises direct from her nesting place when disturbed but creeps through the grass until she has got a considerable distance from it, after which she rises and flies straight away. Thus, one can never hope to find the eggs within fifty yards of where she is flushed and often they may be 200 yards from this spot. She exhibits the same care in approaching her eggs, alighting a hundred yards away and walking through the jungle up to them. Fortunately, the bird when disturbed, generally makes off in a bee line from the object disturbing her so that the egg collector, marking the spot whence she rises generally finds the eggs by working back in a straight line towards the direction whence he has come.

An Indian friend who was so kind as to look after my collectors for me and to collate notes on their breeding habits wrote to me as follows about the breeding habits of this bustard; "A Florican lays only two eggs a year in the breeding season (April and May). Dense forests infested with ferocious animals, scarcely trodden by men, are the places where eggs are laid on the ground. The bird takes great precaution to conceal her eggs, and you can hardly find any eggs within a quarter of a mile from the place where a Florican is seen. She creeps through the forest unobserved to a great distance to lay her eggs. A very careful and extensive search is required to discover them."

Nest there is none, and the eggs are merely laid in some natural depression under shelter of a tussock of grass. Where there is no such convenient hollow the bird scratches one in the soil or lays them on the ground without taking even this much trouble.

The number laid is almost invariably two, though sometimes a single egg may be incubated. It is practically certain that neither

three nor four eggs are ever laid by one bird and the frequent stories recorded to this effect are groundless. It is very noticeable that of the two eggs laid incubation is generally far more advanced in one than the other, and they would appear to be laid at an interval of several days. My own collectors told me that when they found a single egg laid they often waited three to five days before the second was deposited.

Incubation would seem to take about 25-27 days, though this is only guess work. A pair found on the 5th May, and which, when tested in luke warm water, proved to be fresh, were eventually hatched on the 30th of that month and 2nd June, though neither chick survived more than a few hours.

In shape the eggs are typically very regular ovals, the ends being equal. In proportion of length to breadth they vary considerably, but remarkably little otherwise, though a few eggs may be somewhat pointed at one end and in a few other instances at both ends. Curiously enough the extremes of variations are often met with in pairs of eggs laid by the same bird.

In colouration this bird's egg is peculiarly constant, unlike the eggs of *Sypheotis aurita* (the Lesser Florican) which vary very greatly *inter se*. The ground colour is an olive green, in some cases rather brighter, in some rather more brown. The very few exceptions to this ground colour in my collection are one pair with a pale olive green, almost sea green, tint, and another pair with a pale stone grey colour.

The markings consist of small freckles, splashes and blotches, generally longitudinal in character, of brown and purple-brown, rather more profuse at the larger end than elsewhere, but nowhere very numerous. In some eggs these markings are all reduced to freckles, and in these eggs they are often very numerous, very indefinite and often equally distributed over the whole surface. In no eggs are the markings at all bold in character. In a few eggs, not, I think, one in ten, there are a few secondary markings of purple grey or dark lavender grey, but they are very indistinct and, from the colour of the ground, hard to distinguish.

The average of 62 eggs is $2.42'' \times 1.76''$ (= about 62.5 mm. \times 44.8 mm.) and the greatest length and breadth $2.76''$ and $1.85''$

(= about 70 mm. \times 47 mm.), respectively, and the smallest 2.28" and 1.67" (=57.9 mm. \times 42.5 mm.).

When fresh the great majority of *Sypheotis bengalensis* eggs are decidedly a bright *greenish* olive-green, but very soon after being blown they become somewhat paler, and in a year or two often lose much of their green tint and become more an olive-brown. The gloss, also, which in newly taken eggs is generally highly developed, pales considerably with time, though some retain it for many years and few lose it altogether.

In my article on the breeding of the Florican which appeared in Volume XVII of this Journal, I commented on the close-time needed for the protection of this bird and then said that it was probable that the time selected should be from the 1st March to the 1st October. This period is especially required for females, but as the male bird is promiscuous in his courtship and takes no interest in the protection of eggs or young, the period for him might be taken from the 1st March to the 1st August.

As a matter of fact, throughout the area this bird inhabits, nature puts a practical closure on all shooting in August and September, and the extension of the shooting-season for males would have no effect. It would be excellent if the shooting of females could be altogether stopped for some years to come, as there is no doubt that the Florican is one of our Game-Birds which is seriously decreasing in numbers of late years.

The Plate of this bird requires little comment. The iris of the male should be deep brown and the upper mandible should have far less yellow or none at all. The plumage of the head and neck is also unusually thick and heavy, though a few birds may have it as dense when just moulted.

The female is excellent, but the spear-shaped centres to the feathers of the back are perhaps a little too definite.

(To be continued.)

ORCHIDS OF THE BOMBAY PRESIDENCY.

The illustration to this article (*Plate XI—Habenaria Susanne*) appeared at page 171 of this Volume.

EDITORS.

ORCHIDS OF THE BOMBAY PRESIDENCY.

BY

G. A. GAMMIE, F.L.S.

PART XIII.

(Continued from page 174 of this Volume.)

30. *Platanthera*.

Terrestrial, leafy herb. *Flowers* large, in a *raceme* terminating the leafy stem, *sepals* unequal, free, *petals* simple, forming a hood with the dorsal sepal, *lip* continuous with the *column*, produced at the base into a long *spur*, *blade* 3-lobed, *lateral lobes* broad, pectinate, *midlobe* entire, linear, *column* short, without a foot, *anther* broad and large, *cells* slightly divergent, *pollinia* linear, granular, *caudicles* short, *glands* naked, exserted.

1. PLATANTHERA SUSANNÆ, Lindl.; *T. Cooke, Fl. of Bombay, II, p. 712*; *Dalz. and Gibs., p. 269*; *Habenaria Susannæ, Br. Fl. Br. Ind., VI, p. 137*.

Tubers ovoid, globose, rarely lobed, 3 to 4 inches long. *Stems* robust, 2 to 5 feet high, leafy up to the inflorescence. *Leaves* ovate-oblong or oblong-lanceolate, acute or acuminate, imbricate, the upper sheathing, *blades* (becoming smaller upwards and passing into leafy bracts), 2 to 6 inches long by 1 to 2 inches broad. *Bracts* leafy, $2\frac{1}{2}$ to 3 inches long. *Flowers* in 2 to 6 flowered *racemes*, 3 to 4 inches in diameter, white, fragrant, subsessile, *dorsal sepal*, $1\frac{1}{4}$ inch broad and long, broadly rhomboid spreading, *lateral sepals* $1\frac{1}{2}$ by $\frac{3}{4}$ inch, obliquely subquadrately oblong, obtuse, ascending, *petals* linear acute, $1\frac{1}{4}$ inch long by $\frac{1}{8}$ inch broad, *lip* as long as the sepals, *side lobes* $1\frac{1}{2}$ inch long, truncate, the *outer margins* pectinate to the middle, *midlobe* $1\frac{1}{4}$ by $\frac{1}{4}$ inch, *spur* 4 inches long or twice as long as the *ovary*.

Plants start into growth at the onset of the rains and *flowers* appear from August to October.

Distribution.—Abundant throughout the Konkan, North Kanara and Western Ghats. Also in the hill tracts of Eastern Bengal and Assam, Burma, Western Peninsula and the Malay Islands.

Note.—In the Journal of this Society, Vol. X, p. 328, the late Mr. R. M. Dixon has an interesting note on this plant, to the following effect:—The

giant Orchis, although commonly reported to be rare and nowhere abundant, is certainly plentiful on the Bhoma Hill at Khandala, from which place the plant does not seem to have been recorded before. After the flowering is over and the fruiting is finished, the plant with the parent root tuber gradually shrivels up and is ultimately withered in December or January, leaving in the ground a healthy, young root-tuber crowned by a well developed bud from which the flower stem shoots up afresh the following season.

The Marathi name of the plant is *Wagh chaora*, meaning the metacarpus of the tiger's foot. Among the Kath-Karis, Thakurs and other Marathi-speaking people living on the Bhor Ghat, the root-tuber of the Giant Orchis is believed to be a sovereign remedy for the cure of blebs or bullæ, specially those occurring on the metacarpus of the palm of the hand. These blebs or bullæ, on account of their supposed resemblance to the raised metacarpus of the tiger's foot are known as *Wagh chaora* in the Deccan. Hence the vernacular name of the plant. There are some persons who believe that the plant is called *Wagh chaora* because the flower looks like the claws or jaws of a tiger.

PLATE XI. The upper part of a plant with the inflorescence. The generic name is given as *Habenaria*.

(To be continued.)

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA

(INCLUDING THOSE MET WITH IN THE HILL STATIONS
OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

PART XII.

WITH PLATES I AND J.

(Continued from page 766 of this Volume.)

FAMILY—PIERIDÆ.

The members of this family are so subject to variation in the amount of marking on the wings that it is impossible to make a key to the genera without reference to the venation of the wings and other characters which offer difficulties to amateurs.

A. Forewing with all 12 veins present.

a. Male pale blue with black border on upperside,
female somewhat like *Danaüs limniace* in style
of marking *Pareronia*.

b. Male lemon yellow, female sulphur yellow on
upperside *Synchlōë*.

B. Forewing with only 10 veins (veins 8 and 9 absent).

a. Of small size: 1" to 2"; underside hindwing with
no red terminal border *Leptosia*.

(Fig. 15.)

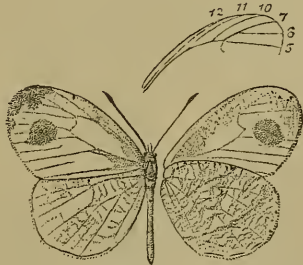


Fig. 15.

b. Larger: 2"·6 to 3"·3; underside with red terminal
border to hindwing *Delias*.

C. Forewing with 11 veins (only vein 8 absent).

- a. Costa serrated. Hindwing underside with orange-red terminal border *Prioneris*.
(Fig. 16)
- b. Costa not serrated. Hindwing underside with no red terminal border.

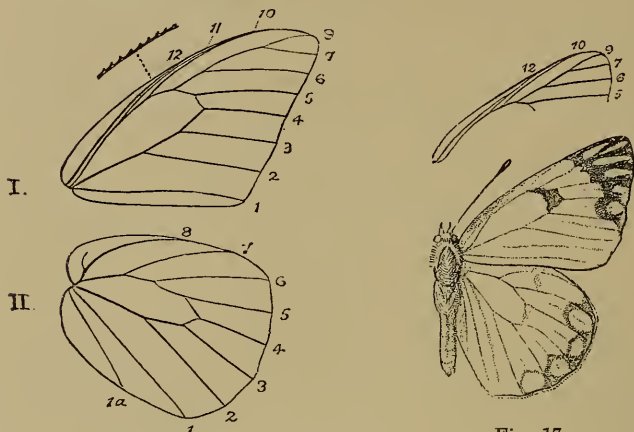


Fig. 16.

Fig. 17.

- a¹. Forewing with vein 11 anastomosing with vein 12 *Anaphæis*.
(Fig. 17.)
- b¹. Forewing with vein 11 not anastomosing with vein 12 (both veins free).
- a². Forewing with vein 6 not stalked with vein 7; size less than 2''-25 *Colotis*.
(Fig. 18.)
- b². Forewing with vein 6 not stalked with vein 7; size 3''-75 to 4'' *Hebomoia*.
- c². Forewing with vein 6 stalked with vein 7, i.e., emitted from vein 7, not from cell.
- a³. Forewing with vein 10 emitted from vein 7, i.e., veins 6, 7, 9, 10 from one common stalk *Colias*.
(Fig. 19.)

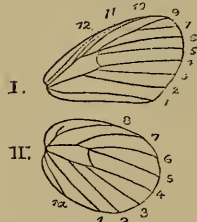


Fig. 18.

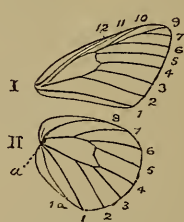


Fig. 19.

- b*³. Forewing with vein 10 emitted from subcostal vein, not stalked with 6, 7, 9.
- a*⁴. Hindwing without a precostal vein .. *Terias*.
- b*⁴. Hindwing with a precostal vein.
- a*⁵. Forewing with vein 11 emitted from the subcostal nervure half-way between base and apex of the cell .. *Catopsilia*.
(Fig. 20.)
- b*⁵. Forewing with vein 11 emitted from subcostal nervure nearer apex than base.
- a*⁶. Forewing with vein 9 very short, given off so near the outer margin of wing as to be nearly absent sometimes *Pieris*.
(Fig. 21.)

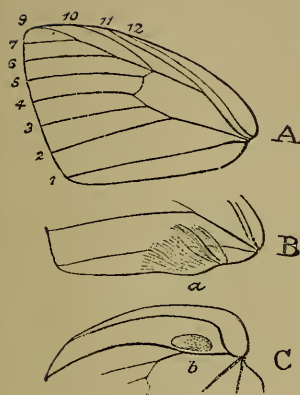


Fig. 20.

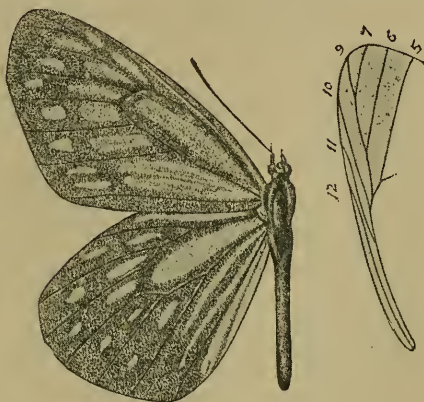


Fig. 21.

- b*⁶. Forewing with vein 9 longer, always given off well before margin of wing.
- a*⁷. Male without specialized tufts of stiff hairs on anal segment at base of clasper ventrally, easily discernible *Appias*.
(Fig. 22.)

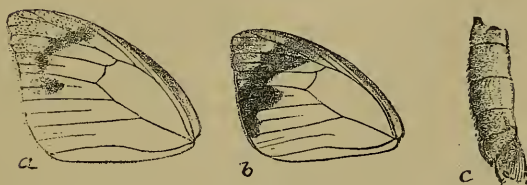


Fig. 22.

- b⁷. Male without any such tufts ventrally at base of claspers.
- a⁸. Forewing upperside white and black without white apical band defined by black and without any orange colour .. *Huphina*.
(Pl. I, figs. 61, 61a.)
- b⁸. Forewing upperside white and black but with white or orange subapical band defined by black (mostly orange).. .. *Leias*.
(Pl. I, fig. 62.)

As said before, these vein characters will not be always ascertainable without some slight vexation; but, with the help of a good lens and a little benzine or spirits of wine, none of them should offer any serious obstacle to running down an insect. The best way to count the veins is round the edge of the wing, vein 2 being a good starting point as it is the first given off from the cell; vein 11 is the last vein given off from the cell.

The larvæ of nearly all the *Pieridæ* are green in colour and of the same type, some few are somewhat hairy, most are somewhat minutely tuberculate; the pupæ are somewhat varied in shape, but all can be referred to three types at the most: one, the normal, suspended like that of a *Papilio* with a nose-point and the ventral line of wings but little prominent, another like this but with the nose-point somewhat lengthened and curved, the wing outline ventrally very prominent, the whole pupa compressed laterally, a third suspended by tail and body-band also, but the band so tight as to press the pupa against the suspension surface: the nose-point somewhat lengthened and upturned, the dorsum flattened behind thorax and laterally produced into a couple of teeth. The three forms of pupa are characteristic of *Catopsilia*, *Pareronia* and *Anaphæis* respectively.

Genus LEPTOSIA.

Only one species. Size 1" to 2" *xiphia*. (Pl. I, fig. 58.)

A weak, white, fragile-looking butterfly, found everywhere, even in Sind, keeping to the shady underwood. It has a large black spot on outer area of forewing. Larva and pupa normal; foodplant *Capers*.

Genus DELIAS.

- A. Hindwing underside: red marginal band margined inwardly with black. Size: 3" to 3".30 *eucharis*. (Pl. I, fig. 59 ♂, 59a ♀.)
- B. Hindwing underside: red band not margined inwardly with black. Size: 2".6 to 3".3 *hierta*.

These insects are weak fliers and are very common; they are easily distinguishable by the red marginal band on underside of hindwing. The larvæ of *eucharis* are gregarious, feed on *mistletoe* and are greasy looking, olive-brown in colour with longish white hairs, 6 or so to each segment. Pupa oily greenish yellow with black markings.

Genus PRIONERIS.

Only one species. Size: 3".40 to 3".50 *sita*.

Certainly not a Plains butterfly; confined to the hills altogether; but has been mentioned here as it is so extraordinarily like *Delias*. It is, however, a very strong flier. Larva feeds on *Capers*.

Genus ANAPHÆIS.

Only one species. Size: 1".75 to 2".5 *mesentina*. (Pl. I, fig. 60.)

Altogether a butterfly of the Plains and one of the commonest. Larvæ gregarious, green, with purplish bands on each side; somewhat hairy. Pupa abnormal as stated above. Foodplant *Capers*.

Genus PIERIS.

A. Hindwing underside: markings green. Size: 1".6 to 2" *glauconome*.

B. Hindwing underside: not green.

a. Forewing upperside: inner margin of apical black area evenly curved. Size: 2".5 to 3" *brassicæ*.

b. Forewing upperside: inner margin of black apical area sinuous or scalloped. Size: 1".6 to 2".3 *canidia*.

This genus is not of the Plains at all; it is confined to the higher hills in the Himalayas and Nilgiris (*canidia*). *Glauconome* has been taken at Karachi in Sind several times, does not occur further south seemingly, but is plentiful in the hills of the North-West. *Brassicæ* is recorded from Lucknow and Umballa in North India, but only as a straggler; it is a Himalayan butterfly; also European. *Canidia* is said to have been taken in Lucknow which is the only record of its appearance in the plain country.

The larvæ of the genus are quite normal, the pupæ are of the type of those of *Anaphæis*. The foodplants are *Crucifere*: cabbage and such like plants.

The character of *a* and *b* is not well marked in the females of the species concerned.

Genus SYNCHLOË.

Only one species. Size: 1".3 to 1".66 *lucilla*.

Genus HUPHINA.

Only one species. Size: 2" to 3" *nerissa*. (Pl. I, figs. 61 ♂, 61a ♀.)

A very common insect, found almost everywhere and a fast, strong flier; somewhat variable according to season and locality.

Larva normal, green; pupa of the *Anaphæis* type. Foodplant *Capers*.

Genus IXIAS.

A. Upperside: ground-colour clear gamboge-yellow.

Size: 1"·70 to 2"·50 *pyrene*. (Pl. J.
figs. 65 ♂, 65a
♀ ♀.)

B. Upperside: ground-colour white.

a. Forewing upperside: preapical orange patch extended into apex of cell. Size: 2"·1 to 2"·6 .. *marianne*. (Pl. J. fig. 62.)

b. Forewing upperside: preapical orange patch not extended into cell. Size: 2" to 2"·2 *nola*.

These are "Orange-tips." *Nola* is probably only a variety or local race of *marianne* as the character of extension of the orange patch is not a good one; it is only found at Mahableshwar on the Western Ghats. The ground-colour of *pyrene* female may be almost white, though never pure white, and may have no orange patch though the black border defining that patch is always present.

Larva green; pupa of the *Anaphæis* type. Foodplant *Capers*.

Genus APPIAS.

This is an extremely difficult group to disentangle as the individuals vary so much with the season and locality in the amount of markings on the wings; some specimens, indeed, of one species which is normally white may be suffused strongly on the underside with yellow or orange. The forewing of the male is nearly always rather narrow and pointed.

A. Forewing: veins 5 and 7 approximate at bases and, therefore, the top discocellular vein missing; the upper discocellular (veinlet uniting veins 5 and 6) less than half the length of the lower discocellular veinlet (uniting veins 4 and 5).

a. Male forewing underside: discal black band narrow; hindwing not richly coloured underneath in wet-season form. Size: 2" to 3" *indra*.

b. Male underside forewing: discal black band broad; hindwing underneath richly coloured in wet-season form. Size: 2"·3 to 2"·75 *narendra*.

B. Forewing: veins 5 and 7 approximate at bases; top discocellular more than half length of lower discocellular.

a. Upperside forewing: outer black margin or area not produced inwardly in interspace 3.

- a*¹. Hindwing underside: with terminal black band; male underside forewing: a prominent white or yellow subapical spot. Size: 2''·5 to 3'' .. *hippo*.
- b*¹. Hindwing underside: with no terminal band and, in the male forewing underside: no apical white or yellow spot.
- a*². Male underside: pure white in wet-season form, tinged with ochraceous in dry-season form.
- a*³. Male underside hindwing: immaculate at all seasons. Size: 2''·1 to 2''·6 *libythea*.
- b*³. Male underside hindwing: veins more or less broadly black, white only in extreme dry-season form. Size: 2''·1 to 2''·7 .. *zelmira*.
- b*². Male underside hindwing: yellow or ochraceous at all seasons. Size: 2''·38 to 2''·94 .. *albina*.
- b*. Upperside forewing in the male: outer black margin produced inwardly into interspace 3 (except in dry-season form of *leis*).
- a*¹. Male underside forewing: oblique, curved black band on outer half terminated on vein 2, sometimes reduced to a mere black spot in interspace 3. Size: 1''·9 to 2''·6. *leis*.
- b*¹. Male underside forewing: oblique, curved black band on outer half extended to tornal angle or altogether absent. Size: 2''·55 to 3'' .. *wardi*.

The larvæ of all these are very like each other, fairly normal in aspect; the pupæ are of the *Anaphæis* type. Foodplant *Capers*.

Genus CATOPSILIA.

- A*. Underside: without irroration of transverse reddish-brown striæ. Size: 1''·8 to 3''·4 *crocale*. (Pl. L., figs. 72 ♂, 72a ♀ ♀ of form *catilla*; 73 ♂, 73ab ♀ ♀ of *crocale*.)
- B*. Underside: with such irroration. Size: 2'' to 2''·75. *pyranthe*. (Pl. J. figs. 64 ♂, 64a ♀.)

The first species is very liable to variation in the amount of black on the upperside in the females; the males are very constant.

Very common butterflies; fast fliers.

Larvæ and pupæ altogether normal. Foodplants: *Leguminosæ*; nearly confined to the genus *Cassia*.

Genus COLIAS.

Only one species, said to have been obtained at Lucknow.

Size: 2" to 2".5 *fieldii*.

A Himalayan species, visiting the Plains only as a straggler.

Genus TERIAS.

A. Forewing underside: cell unmarked.

a. Male with secondary sexual characters on both wings; both sexes with dark line on discocellulars of underside of forewing.

a¹. Forewing: apex rounded. Size: 1".4 to 1".7 .. *venata*. (Pl. K., fig. 70, 70a, 70b, 70c.)

b¹. Forewing: apex acute. Size 1".4 to 1".9 .. *læta*. (Pl. K., fig. 69, 69a.)

Venata has the black margin of forewing reaching tornus, *læta* has it stopping before it.

b. Male with no secondary sexual characters; both sexes with two dots on discocellulars on underside of forewing. Size: 1".25 to 1".75 .. *libythea*.

B. Forewing underside: two marks in basal half of cell.

Size: 1".60 to 2".20 *hecabe*. (Pl. K., figs. 71, 71 a, b, c, all forms.)

C. Forewing underside: three marks in cell. Size: 1".60 to 2".10.. .. . *silhetana*.

Venata is often difficult to distinguish from *libythea* as the marks may be obsolete; at least the females are: for the males can be told at once by presence or absence of sex-marks; however *venata* is often powdered with blackish scales on upperside. *Læta* is unmistakeable from the shape of the wing and the bar-marking, as also the colour on the underside of hind-wing.

The larvæ and pupæ are normal, *i.e.*, this is known of all except *T. læta* which has never been bred; and this species is remarkable as being very plentiful in the dry season, nearly completely absent during the monsoon months. Foodplants: *Leguminosæ*; genus *Cassia*, &c.

All the species are some shade of sulphur-yellow with black borders to the wings.

Genus COLOTIS.

A. Upperside: ground-colour salmon-pink; female sometimes with ground-colour white.

a. Upperside: sometimes white in the female. Terminal black band on hindwing narrow with a more or less obsolescent series of spots of the same tint as ground-colour so arranged as to break up the inner edge of band. Size: 1".5 to 2" .. *amata*. (Pl. J., fig. 68.)

b. Upperside: always salmon-pink. Terminal black band on hindwing broad and immaculate. Size: 1".5 to 2" *protractus*.

B. Upperside forewing: salmon-pink, of hindwing white, of female sometimes both wings white. Terminal black band of hindwing broad. Size: 1".5 to 1".8. *phisadia*.

This species is like *protractus* except that the spots on the apical band of forewing are of the ground-colour and not suffused with grey as in that species.

C. Upperside: ground-colour of both wings orange-pink; female sometimes with ground-colour white or white suffused with salmon-buff.

a. Upperside forewing: four or five spots of ground-colour enclosed in terminal black border. Size: 1".8 to 2".25 *fausta*.

b. Upperside forewing: never more than three spots included in the black border. Size: 1".8 to 2".25 *tripuncta*.

Fausta is found in Sind, Panjab, Rajputana, Bombay; *tripuncta* in Sind, Bombay, Poona, Nilgiris, Bengal, Orissa, Ganjam.

D. Upperside: ground-colour white.

a. Upperside forewing: no orange or carmine markings, a broad, black, terminal immaculate band. Size: 1".5 to 2" *vestalis*.

b. Upperside forewing: orange or carmine apical patch present.

*a*¹. Upperside forewing: apical patch orange.

*a*². Forewing upperside: the orange patch not bordered with black on inner side. Size: 1".4 to 2" *eucharis*.

*b*². Forewing upperside: orange patch bordered on inner side with black. Size: 1".2 to 1".75 *etrida*. (Pl. J., figs. 67, ♂ 67a ♀.)

*b*¹. Upperside forewing: apical patch crimson. Size: 1".5 to 1".75 *danaë*.

These last three are the small "Orange-tips." None of the genus are found in jungle countries nor in the hills proper. They are all butterflies of the Plains, though *amata* occurs in the Konkan.

The larvæ of all that have been bred are normal as well as the pupæ; except the pupa of *C. eucharis* which has the ventral line of wings very convex in the manner of *Pareronia*. *C. amata*, *protractus*, *phisadia* and *vestalis* are divided from the others by the fact that they feed upon *Salvadora persica* of the Family *Salvadoraceæ*; the others feed upon *Capparis*. *Salvadora persica* is the "Mustard Tree" of Scripture. There is another species also, *Salvadora oleoides*, in Sind upon which larvæ are occasionally found.

Genus HEBOMOIA.

Only one species. Size: 3".75 to 4" *glaucippe*. (Pl. J.,
figs. 66 ♂,
66a ♀.)

This is the Large Orange-tip, a very powerful, fast flying insect, not uncommon along the Western Ghats and in the Konkan.

The larva is not quite normal, green in colour; the pupa is of normal shape, also green. Foodplant: *Capers*, especially *Capparis moonii* and *Cratæva religiosa*.

Genus PARERONIA.

A. Male: forewing upperside: terminal black border narrow, traversed by a more or less complete sub-terminal series of bluish-white spots; female is somewhat like *Danaïs aglea* and has sometimes the base of the wings yellow; the eyes of both sexes are generally green. Size: 2".75 to 3".5 *hippia*. (Pl. J.,
figs. 63 ♂,
63a ♀.)

B. Male: forewing upperside: terminal black border broad with no light spots or only a slight trace or one or two, female like the last but never with yellow at base of wings. Size: 3" to 3".4.. .. *pingasa*.

Hippia is common and really the only one that occurs in the Plains; the other may be found along the borders, more probably in the Hill Stations of Matheran and Mahableshwar in the Western Ghats. It is generally possible to distinguish *hippia* from *pingasa* by the more or less nacreous (like mother-of-pearl) lustre of the underside in the former, especially on the hindwing, as well as by its lighter blue colour.

The larvæ are nearly normal, the pupæ are much compressed laterally, have long, curved beaks and the ventral wing-outline very prominent. The foodplants are *Capers*.

The *Pieridæ* as a family are characterized by "six well developed legs,

the same in both sexes, no pad on front tibiæ. Claws bifid or toothed; an empodium." The members of it are generally popularly known as "whites" because, in the vast majority of the species of the world, the prevailing colour is white. Nearly all species are marked with black to an extent varying generally with the time of year; in the tropics this means with the period of young shoots rich in moisture and juices or the time when such is not the case.

There are upwards of 1,000 species in the world, Colonel Bingham, enumerates 90 as occurring in British India of which number some 42 will be mentioned here. The family is represented in all countries and in all climates from 18,000 feet elevation to sea-level according to species and genera, in the driest regions as well as in districts possessing the heaviest rainfall. More particular information will be given for each genus and species here treated of in its proper place.

Home representatives of the family are the Cabbage Whites, the Clouded Yellows, the Orange-tips, the Brimstone, Bath White, &c. Some of the genera are numerous in species and the latter are often extremely numerous in individuals in India as well as at home, some of the species of *Catopsilia*, *Appias*, *Terias*, *Colotis* extremely so in India. Like the Cabbage White at home *Catopsilia crocale* and *C. pyranthe* as well as *Appias libythea* and *hippo* are veritable pests in certain years, defoliating every foodplant in certain localities to such an extent that millions of the caterpillars die of starvation. The phenomenon is perhaps not as noticeable as at home for the very sufficient reason that the results of a visitation do not affect people in the same way because the trees that the insects feed upon are not of any economic importance to human beings as food. Nonetheless, however, is it a wonderful sight to see millions of larvæ covering the trunks of huge trees, descending from the leafless branches in search of the wherewithal to further their growth. In such numbers they come that, literally, not an inch of bark is visible; often they are packed three deep one on top of the other. A vast number must, of course, die for the odds are against any of this host finding a new tree to ascend; and, even if they did, the probabilities of their finding any leaves on it would be very slight indeed. In such seasons of prolific broods of larvæ the imagines or perfect insects appear in such numbers that, when disturbed from their resting places beneath the leaves in the jungles, they nearly darken the air in yellow clouds (*Catopsilia*). It is easily conceivable that, were these butterflies to remain stationary in any single locality, there would be but small chance for their progeny. They seem to instinctively know this for they migrate in countless numbers to other districts. These migrations have been noticed by travellers in many parts of the world. All fly in one direction to start with and Colonel Bingham says that he has noticed that the flight is against the wind. He remarks that one of the

consequences of the dispersal of individuals thus effected leads to the breaking down of distinctions between local races thus preventing variation in the insects of widely separated districts. These migrating *Pieride* are all very strong fliers and some individuals would doubtless go far from their place of origin ; in the course of a few years, probably hundreds of miles.

The prevailing colouring is, as already stated, white, often suffused with some shade of yellow above as well as below, the upperside often with black bordering which is subject to variation in extent and intensity according to the season, sometimes, indeed, affecting very nearly the whole surface in the so-called wet-season broods where the dry-season individuals are lightly marked. In certain genera (*Colotis*) we get species that are salmon-coloured, in others (*Colotis*, *Hebomoia*, *Ixias*) the apex of the forewing in some species has an orange or yellow or carmine patch ; in *Prioneris* and *Delias* the underside of the hindwing may have a broad red terminal border or basal red spots ; *Pareronia* has in the male some shade of light blue with black veining and border on the upperside ; in *Appias* the underside in certain species is subject to suffusion with deep yellow while *Terias* is always some shade of yellow above and below. Fresh young shoots that appear in the hot weather in India produce large specimens with extensive, intense black markings while the comparatively hard, dry leaves of the cold weather result in smaller and much lighter insects. Now, in the generality of cases, dry, hard leaves mean slow feeding, consequently slow larval growth and large, light specimens ; new, tender leaves have the effect of allowing quicker growth, producing smaller, darker individuals. In the *Pieride*, seemingly, the rate of growth of the larva is more or less constant whatever the quality of the food available and, therefore, the more food and the easier it is to assimilate, the larger the resulting imago is. All the larvæ of the family are voracious eaters and feed upon soft-leaved trees and bushes or upon herbaceous plants the young shoots of which are fast growing and very juicy ; the soft leaves admit of the quantity of food being always sufficiently easily assimilable to produce the normal growth and the great softness of the new shoots gives an extra impetus to increasing the size, while their extreme juiciness produces the exuberance of black pigment which is so remarkable in the family. The colouration of the wings is characteristic at all seasons and its style never varies though the extent may ; even on the undersides the style is constant and there is nothing ever to be found of the curious seasonal dimorphism existing in some nymphaline and satyrine butterflies. The shapes of the wings are the same at all seasons, also though, perhaps, *Terias læta* has the apex of the forewing more produced in the cold weather.

The larger whites are very strong, fast fliers and progress in the skipping style, in successive undulations, *Hebomoia*, *Catopsilia* ; *Delias*, however

though large, has weak wings and flutters straight ahead. Most of the lesser species fly straight along in the usual way except *Leptosia* which is peculiar in having a slow sailing, deliberate flight of its own. They rest on the undersides of leaves with the wings closed over their backs; *Hebomoia* often rests on the ground with the forewings sunk down between the hinder ones so as to show only the darker parts and is then very difficult to see. They are all fond of the sunlight with the exception of *Pareronia* and *Leptosia* which are insects of the jungles while the others affect more open ground. *Catopsilia* and *Prioneris* often fly high over the tree tops while most of the others keep close to the ground; *Hebomoia* is also often to be seen high up in the air. They all are fond of flowers and *Catopsilia*, *Appias*, *Prioneris*, *Terias* come to moist spots in nallas and on roads in immense numbers during the hot weather.

The egg is cylindrical, narrowed towards the top but very shortly, generally twice as high as broad, with longitudinal ridges some of which join before they reach the top, their ends forming a circle of little teeth or a crown round the micropile, the surface generally finely transverse-lined. The colour is white, generally changing to yellow or orange, sometimes very light with red blotches or rings. They are mostly laid singly on a young shoot, on the edge of a leaf, generally on the upper or lower surface. *Colotis amata* however lays them in batches of 20 to 40, sometimes less, on the undersides of leaves and *Anaphæis mesentina* likewise though, as this insect generally affects *Capparis aphylla* as the foodplant of the larvæ, they are laid on the twigs, there being, as a rule, no leaves.

The larvæ are always without processes of any sort and are generally some shade of green with transverse depressed fine lines, mostly 7 to each segment, each interval between two lines with a row of black or white tubercles, each with a hair growing out of the top; some have a heavy fringe of fine, longish hairs along the sides in the subspiracular region but this is not very common. The head is always round, the anal segment sometimes more or less bifid, the general shape of the body being cylindrical, very slightly thickest in the middle. *Anaphæis mesentina* has a coloured larva with a broad ochreous dorsal band and brown-purple sides. Most of the caterpillars are spotted indistinctly under the skin and have a dorsal or spiracular white band or line, or both. They are not very active, some of them drop from the leaf when disturbed; the great majority rest in the middle of the upperside of a leaf, lying along the midrib on a bed of silk and generally full stretched though some occasionally sit with the front part raised, others with the hinder end in the air. As a rule they eject a sort of green liquid from the mouth when disturbed but do not otherwise possess any visible way of defending themselves. A few turn pink before pupating.

The pupa is of two types, one somewhat resembling a smooth *Papilio chrysalis* with a frontal beak and ventrally bulged wings; the other quite different, having the dorsal middle segments produced horizontally outwards in triangular sharp teeth, the dorsal line of the thorax angled and the head produced into a generally upwards-curved snout. They all have the tail and body-band fixture of the *Papilionidæ*; the former suspending themselves as in that family, the latter angled ones often lying horizontally on the top of a leaf and closely pressed against it, *i.e.*, with a very short body-band. All wriggle when touched, the motion being a side to side one from the segments 9, 10, 11; the junctions of segments 8-9, 9-10, 10-11, being so formed as to permit of this which, by the way, is common to all lepidopterous pupæ. Sometimes this wriggling is accompanied by a slight, dull knocking noise.

The larvæ all eat voraciously, grow fast and the pupal stage is never prolonged. They are often much parasitised by ichneumons and flies, the most unfortunate in this respect being various species of *Terias* and *Colotis*.

The caterpillars offer so few points of difference in shape and colour that a classification of the genera according to them would be rather difficult as the little pattern that exists may be quite absent in species that normally have it quite strongly developed; the size and number of the tubercles is also liable to variation. Another objection is, and it is perhaps the chief one, there is not very much material to go on for there are many of the larval and pupal stages not yet worked out. One large classification on the pupæ is possible, as for example:

Smooth, normal pupæ, suspending themselves like the *Papilionidæ*: Genera *Leptosia*, *Catopsilia*, *Ixias*, *Hebomoia*, *Terias*, *Colotis*, *Pareronia*.

Angulated pupæ, with tail-fixing and close body-band, formed often on the upperside of a leaf or other horizontal position: *Delias*, *Prioneris*, *Anaphæis*, *Appias*, *Huphina*, *Colias*, *Pieris*.

The first group might be further subdivided into two by the shape as follows:—

Normal pupæ with slight ventral wing-bulge and short snout; Genera *Leptosia*, *Catopsilia*, *Hebomoia*, *Terias* and *Colotis* with the exception of *Colotis eucharis*.

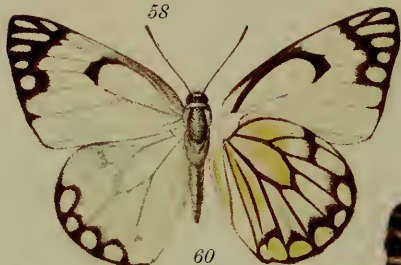
Abnormal pupæ with very accentuated ventral wing-bulge, the body laterally compressed and a long curved snout: Genera *Ixias*, *Pareronia* and *Colotis eucharis*.

Here again, in the first sub-group *Catopsilia* and *Hebomoia* could easily be separated from *Leptosia-Terias-Colotis* and it is possible to separate *Catopsilia* from *Hebomoia* by the shape of the larvæ and their colouration as:

Larva distinctly flanged on the spiracular line, glaucous green in colour,



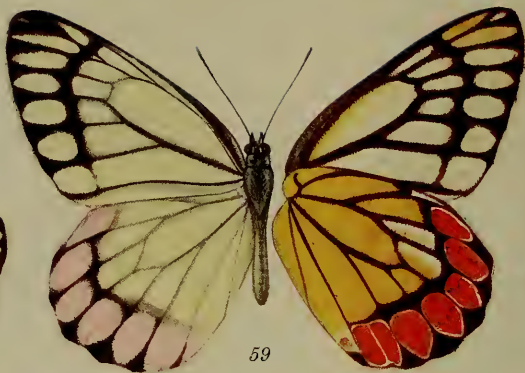
58



60



60a



59



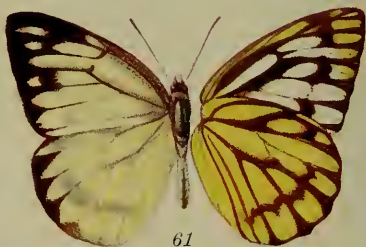
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61a



61



63a



63

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

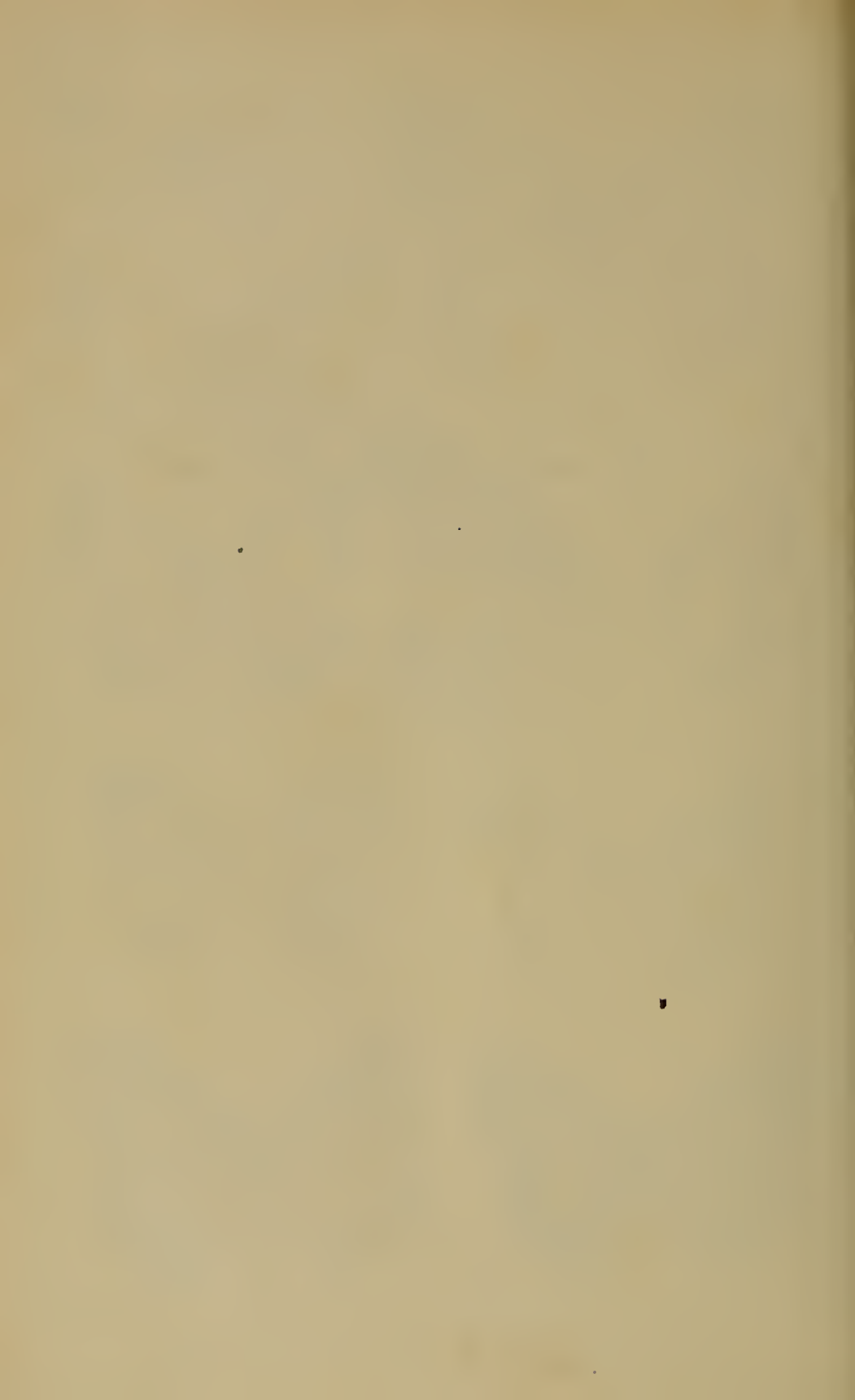
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EXPLANATION OF PLATE I,

- Fig. 58. *Leptosia xyphia*, ♂
,, 59. *Delias eucharis*, ♂; 59 a, ♀
,, 60. *Anaphæis mesentina*, ♂; 60 a, ♀
,, 61. *Huphina nerissa*, ♂; 61 a, ♀
,, 62. *Ixias marianne*, ♂
,, 63. *Pereronia hippia*, ♂



swollen about segments 3, 4 with a spiracular line of iridescent tubercles : *Hebomoia*.

Larva normally cylindrical all along, green or yellowish green, a white spiracular band and transverse rows of black tubercles to each segment, those immediately above the spiracular band generally more or less strongly developed forming a black supraspiracular band : *Catopsilia*.

The larva again of *Leptosia* might be separated off from *Terias-Colotis* by the fact that it is smaller and slighter than them ; but such classification is useless.

The second group having angulated *chrysalides* may be subdivided to a certain extent as follows :

Larva not green : *Anaphæis*, *Delias*. And again these may be known :

Larva light brown : *Delias*.

Larva ochreous and purplish brown in longitudinal bands : *Anaphæis*.

Larva green of some shade : *Prioneris*, *Appias*, *Huphina*, *Colias*, *Pieris*. These being insufficiently known it is impossible to further distinguish them at present.

The food-plants of the members of the family are various though all (leaving out *Pieris*, *Colias*, *Synchlœ*) belong to the *Leguminosæ*, *Capparideæ*, *Salvadoraceæ* : *Loranthaceæ*, *Euphorbiaceæ*, as follows :

Leguminosæ : *Terias*, *Catopsilia*.

Capparideæ : *Leptosia*, *Pareronia*, *Prioneris*, *Ixias*, *Anaphæis*, *Huphina*, *Colotis*, *Appias* (except *Appias wardi*).

Loranthaceæ : *Delias*.

Euphorbiaceæ : *Appias wardi*.

Salvadoraceæ : *Colotis*.

Most of the larvæ that feed upon Capers will feed upon any Caper ; *Terias* will also feed upon nearly any leguminous plant ; *Catopsilia* is nearly confined to the genus *Cassia* but will feed upon most of the species of that genus.

87. *Leptosia xiphia*.—*Upperside* : white ; base of wings very slightly powdered with minute black scales. Forewing : costa speckled obscurely with black, apex black, the inner margin of this inwardly angulate ; a very large, somewhat pear-shaped, postdiscal spot also black. Hindwing : white, uniform ; in most specimens an obscure, extremely slender, terminal black line. *Underside* : white, costal margin ; and apex of forewing broadly, and the whole surface of the hindwing irrorated with transverse, very slender, greenish strigæ and minute dots ; these on the hindwing have a tendency to form subbasal, medial and discal, obliquely transverse, obscure bands ; forewing : the postdiscal black spot as on the upperside ; terminal margins of both fore and hindwings with minute, black, short, transverse, slender lines at the apices of the veins, that have a tendency to coalesce and form a terminal continuous line as on the upperside. Antennæ dark brown

spotted with white, head slightly brownish, thorax and abdomen white. Female similar, the black markings on the upper side of the fore wing on the whole slightly broader, but not invariably so.

Egg.—Cylindrical, slightly swollen in middle, becoming abruptly narrow at top; 13 longitudinal ridges of triangular section of which only six reach the top where their ends, as minute teeth, surround the flat end. Colour blue. H: 1.2mm.; B: 0.5mm.

Larva.—Head round, with very prominent, shiny, black eyes, covered with black, short, stiff, semi-appressed bristles; smaller than segment 2; colour green. Body cylindrical, broadest at segments 4, 5 and 6, thinning off suddenly at segment 13. Anal segment narrow, square at end with a colourless, curved, straight hair from each corner pointing backwards, rising from a cylindrical, white tubercle. The whole length of the body is lined transversely by depressed lines at equal distances from each other; between these lines are rows of black, erect, short bristles surrounded at their bases by a circular, green mark; there is a single row between each two lines; interspersed among these bristles are a few white, cylindrical tubercles bearing each an erect, white, longish hair generally carrying at its tip a drop of amber-coloured, transparent liquid; these long hairs are most numerous on segments 2, 12 and 13. Ventrums also haired at sides. Spiracles nearly oval, very small and difficult to distinguish. Colour grey-green with an indistinct, supraspiracular, dark line, below which is a whitish spiracular line; a darkish dorsal line. L.: 17mm; B.: 2.5mm.

Pupa.—Head small, eyes nearly hidden by the broad base of the short, conical beak. The pupa is of the type of *Terias hecabe*. It is slight and delicate-looking. Segment 2 broad and waved as to hinder and front margins, flattish on top. Thorax short, humped, very slightly carinated, as well as segment 2, dorsally. Sides from shoulders to segment 8 parallel. Part made up of head and segment 2 parallel-sided and narrower than shoulders. Section of abdomen from segment 9 to end circular. Constriction at segment laterally wide and slight, dorsally ordinary. Cremaster stout, square, with a dorsal depression near hinder margin. Apex of thoracic (ventral) expansion of wing cases, which is parabolic, opposite segment 7. Spiracles oval, light ordinary in size. No spiracle of segment 2 visible. Surface glabrous, very minutely transversely striated, shiny. Colour very transparent green, often suffused with pink; a dorsal and lateral brown line the whole length of pupa, covered with pink-brown spots obsolescently and sparsely; a lateral row of black spots on segments 3 to 12, those on segment 5 exuding a black or white liquid which dries like gum; there is one spot laterally to each segment; beak yellow with a ring of 7 black spots half way up. L.: 13.6 mm.; B.: 3 mm. H. at apex of wing-bulge: 4.4mm.

Habits.—The egg is laid on the underside of a leaf near the

ground, generally on a young leaf; the larva lives on the underside as a very general rule, but may be found on the upperside also; it has the slow-moving habits of the larvæ of the family and does not wander far to pupate. The pupa is attached to the underside of a leaf, the tail-pad is fairly thick and the attachment therefore strong, the body band is fairly loose. The growth of the larva is fast and the duration of the pupal stage about a week. The butterfly is the weakest flier of the whole family; a flimsy little thing that never rises more than a foot or so from the ground and may at all times be found in the undergrowth, fluttering along weakly, with the wings held horizontally, open for longer intervals than is usual with any other member. Notwithstanding its small size, it is a conspicuous little insect when flying because of its pure white colour, with the single large black spot; when at rest it closes the wings, sinks the upper into the hindwings and becomes nearly invisible from the protective marking of greenish strigæ and lines which cover the underparts that remain exposed; it sits generally on the underside of a leaf or on a thin perpendicular plant-stem or dead stick. The food-plants of its larva are Capers of probably all species except the absolutely herbaceous ones. It has been actually bred upon *Capparis heyneana* and *Cratæva religiosa* in Kanara. The distribution according to Colonel Bingham is "the lower Ranges of the Himalayas from Mussoorie to Sikkim; Central, Western and Southern India *but not in the desert tracts*; Ceylon; Assam; Burma and Tenasserim; extending to China and the Malayan Subregion." What is meant here by the "desert tract" is not exactly known. If Sind is included in the term, then the statement is wrong (the italics are not Colonel Bingham's) for the insect has been seen often in the neighbourhood of Karachi and in other parts of that country; it is not uncommon in Gadag and Bijapur of the Bombay Presidency. The probability is that it exists anywhere there are opportunities for the food-plants to grow. The little butterfly is not subject to much seasonal variation; it only affects the tone of the green on the underside and, to a very limited extent, the size of the black markings on the upperside as also their intensity.

88. *Delias hierta*.—male and female closely resemble *D. eucharis*, but can be distinguished as follows :—male *upperside* : fore wing : the black margins to the veins more diffuse ; the transverse, postdiscal fascia diffuse, ill-defined, oblique, not parallel to termen in its lower portion but terminated at apex of vein 2 ; the apical portion of the wing beyond the fascia more or less so thickly shaded with black scales as to leave the white lanceolate spaces between the veins (so prominent in *eucharis*) ill-defined and obscure. Hind wing white, the black venation and terminal narrows, black border as well as the subterminal vermilion-red spots between the veins on the underside show through by transparency. *Underside* : fore wing as in *eucharis*, but the back margins to the veins much broader and the postdiscal, transverse fascia as on the upperside, oblique but broader. Hind wing differs from that of *eucharis* in the much deeper chrome-yellow tint of the ground-colour, the postdiscal, black, curved fascia that in *eucharis* separates the yellow from the subterminal vermilion-red spots entirely wanting, the red spots themselves pointed inwardly, not subcordate, they conspicuously increase in size posteriorly. Antennæ, head, thorax and abdomen similar to those of *eucharis*. Female differs from the female of *eucharis* on the upperside by the very much darker shading, especially on the forewing and by the postdiscal, transverse band which is as in the male oblique but broader. Hind wing also more darkly shaded, the postdiscal, transverse, curved, black band entirely absent. *Underside* as in the male but darker, the forewing especially more thickly shaded with black scaling, the preapical interspaces tinged with yellow. Antennæ, thorax and abdomen similar to those in *eucharis*. Expanse : 78-84mm.

Habits.—As far as is known the species has not been bred. Specimens from the Himalayas are said to be paler than those from Burma and have the yellow on hind wing on the underside often restricted to the base and to the posterior half of wing. There are two very nearly allied races or species called *D. meta-rete* and *ethira* from Southern Tenasserim and Madras ; Orissa ; Lower Bengal, respectively. *D. hierta* exists in the Himalayas from Kumaon to Sikhim in the low, hot valleys ; Bengal ; Calcutta (*de Nicéville*) ; Assam ; Burma to Northern Tenasserim ; extending to Siam. The larva of another species from Nepal, Sikhim, Assam, Burma, Tenasserim, extending to the Malay Peninsula and Borneo and, on the east, to South China, namely, *D. aglaia*, is, from the description, probably very similar to that of our *D. eucharis* ; but is said to feed upon *Nauclea rotundifolia* a species belonging to the family *Rubiaceæ*.

89. *Delias eucharis*. *Upperside*: white. Fore wing: the veins broadly black, this colour broadened triangularly at the termination of the veins, costal margin narrowly black; a broad, black, postdiscal, transverse band from costa to dorsum, sloped obliquely outwards from costa to vein 4, thence parallel to termen. Hind wing with the veins similar but for three-fourths of their length much more narrowly black; a postdiscal, transverse, black band as on the fore wing but much narrower, curved and extended only between veins 2 and 6; beyond this the veins are more broadly black and this colour, as on the fore wing, broadens out triangularly at the termination of the veins; the interspaces beyond the postdiscal, black band pink, due to the vermilion coloration of the underside showing through. *Underside*: fore wing similar but the black edging to the veins much broader, the upper two interspaces beyond the postdiscal, transverse band tinged with yellow. Hind wing: ground-colour bright yellow, the veins and transverse, postdiscal band as on the upperside but much more broadly black, the latter extended from the costa to vein 2; the interspaces between the veins beyond the postdiscal fascia with a series of broadly lanceolate or cone-shaped, vermilion-red spots, each spot very narrowly edged with white; the basal portion of interspace 6 white, in contrast to the bright yellow of the ground-colour. Antennæ black; head, thorax and abdomen white, the apical joint of the palpi black; the head and thorax with a mixture of black hairs that gives these parts a grey-blue appearance. *Upper and undersides* similar to those in the female, but the black edging to the veins and the postdiscal, transverse bands on both fore and hind wings very much broader. Expanse: 80-85mm.

Egg.—Light yellow in colour; white immediately after laying; very shiny, of an ordinary size, ovoid in shape, truncated at bottom, standing erect, smooth with indications of course longitudinal striation.

Larva.—(Pl. 1, figure 17.) Head round, flattish, black, with a white line at base of jaws and mandibles; antennæ white, black tipped. Body cylindrical; 2nd segment slightly smaller than head; anal segment ends round and is short. The colour of the body is a greasy, greenish-yellow brown. The front half of the 2nd segment is white, with a black patch dorsally behind the white part; there is a lateral white line on segments 2 and 3. The head is sparsely covered with long, white hairs, those near the top of face being longer than the others. The 2nd segment has a collar of 6 longish white hairs. There is a subdorsal row of long, white, erect hairs, one to each segment proceeding each from a white tubercle; there is also a dorsolateral and supraspiracular row of white hairs, each hair proceeding from a white tubercle. The body is besides covered with small white tubercles, each surmounted by a small erect, white hair. Spiracles smallish, oval, light. Ventrums yellow. L: 40mm.; B: 6mm.

Pupa.—(Pl. 1, figure 17.) Head round in front surmounted on its vertex by two subdorsal cylindrical, round-topped, short tubercles, one on each side; and with a single central, short spherical, very short-pedicelled tubercle, pointing straight forward. 2nd segment highly carinated in dorsal line and slightly convex. Thorax also carinated in dorsal line, but separated from 2nd segment by a depression, sloping up considerably to apex and down again to 4th segment, short, with a broad base—short tubercle on the shoulder, convex. Wing-line very slightly laterally expanded at the commencement, flush afterwards. Abdomen circular in transverse section, swollen at the 7th segment which is the stoutest part of the body, decreasing gradually afterwards to the stout triangular cremaster which is curved down at the end. There is a dorsal row of pointed, conical, rather large tubercles, a subdorsal row of much smaller ones on segments 2 to 12 (the dorsal ones only on segments 6 to 11) and a suprspiracular row on segments 3 to 9. The surface is glabrous, shiny, and of a slightly greenish, light yellow. The front tubercle of head, all the dorsal tubercles, the lateral tubercles of segments 6 to 9, are shiny black. There is a shiny black mark dorsally on the very front of the thorax, on the eye-ball, and behind the shoulder-tubercle; also, generally, a black, curved line round the front of the shoulder-tubercle, round the front of the eye-ball, and triangular marks along the terminal margin of wings, six to each; the antennæ are sometimes transversely striated with black and the inner margin of wings, underside of head and space between the antennæ are often thickly lined with black; the abdomen is patched laterally with black on the 10th to 12th segments; the sides, underside, the base of cremaster are marked more or less with the same shiny black. L: 25mm.; B: 7mm.

Habits.—The eggs are laid in batches of 10 to 20 on the underside of a leaf, without order of any sort though close together. The larvæ on emerging proceed to eat the egg-shell and generally demolish each its own totally before moving off. The whole brood then goes off one after the other, closely following each other, to the margin of the leaf which is nearly always an old one and never a very young one. They commence feeding side by side, finishing one leaf after another; and they live like this right through all the stages. They are always badly parasitised and generally by *Diptera* or flies. They are sluggish in their movements and drop by a silk when disturbed, though not very readily. When about to pupate, each larva goes off by itself and ties itself up by a tail-pad and body-string to a horizontal or perpendicular surface, the attachment being strong and the body-

string close. The butterfly takes about a week to emerge and all of one brood do not necessarily emerge the same day because the larvæ take uneven periods to grow, some getting ahead of others; so the pupation of a brood does not all take place on the same day; some individuals may be several days behind the main body. The perfect insects are weak fliers and flutter about, hardly ever flying straight; they frequent trees and are generally found flying round them, mango trees being particular favourites as they are such good hosts for the parasitic mistletoes, *Loranthus* of various species. They fly fairly high as a rule and keep to places where there is tree-growth because of the food-plant which is only found on woody vegetation. They rest with the wings closed over the back, are found on the wing in all weather and occasionally may be seen drinking at moist patches on roads and in river-beds in the hot weather; they also frequent flowers; and generally sit down to enjoy their repast, never hovering or agitating their wings (few whites do this) while thus engaged; they come to a complete rest. The food-plant is *Loranthus* of various species as already stated and it has been bred upon *L. longiflorus*, Desrouss; *elasticus*, Desrouss, and *scurrula*, L., but nearly certainly feeds upon them all. The distribution is the Himalayas up to 7,000 feet; the whole of continental India except the desert tracts; Ceylon. There are 7 species of *Delias* enumerated by Colonel Bingham for British India, with four Races; 11 forms, that is, of which 4 have been alluded to above, and have red terminal markings on the underside. *D. descombesi*, Boisd., from Sikhim, Butan, Assam, Burma, Tenasserim, Siam, Malay Peninsula has red basal markings as well as *D. aglaia*, L., with a nearly similar distribution but extending to Borneo and China; and *D. thysbe*, Cramer, from the same places as *descombesi*. *Delias agostina*, Hewtson, and *D. belladonna*, Fabr., have no red markings on the underside; they are both Himalayan, extending to Assam; the latter from Kulu eastwards extending to China, the former limited westwards by Nepal and not found in China. *Khanda*, Doherty, is a form or race of *thysbe*; *agoranis*, Grose-Smith, of *agostina*.

90. *Prioneris sita*. ♂. *Upperside*: white, with a slight glaucous tint. Fore and hind wings: the postdisical markings of the *underside* seen.

through faintly by transparency; all the veins of the fore wing from base and the veins of the hind wing on the outer third margined narrowly with black, that towards the terminal margin broadens, coalesces, and forms a band on the extreme margin; on the fore wing this is comparatively broad and the black markings more or less triangular; at each vein on the hind wing the band is reduced to mere black lines, slightly broader anteriorly than posteriorly. *Underside*: fore wing white, costa black, apex suffused with yellow, all the veins from the base broadly bordered with black that does not extend towards their apices; an ill-defined transverse, somewhat diffuse; postdiscal black band from veins 1 to 7. Hind wing: rich chrome-yellow up to a postdiscal black band, beyond which the ground-colour is white with a series of large, terminal, vermillion-red, rectangular or truncated, cone-shaped spots; veins from base bordered somewhat narrowly but conspicuously with black. Antennæ brownish black, head and thorax clothed with long bluish-grey hairs, abdomen glaucous white; beneath: the palpi and thorax greyish white, abdomen white. Female very similar, the black edgings to the veins on fore and hind wings on both upper and undersides broader; on the upperside the veins of the hind wing as well as of the fore being black right up to the base. *Upperside*: fore and hind wings with a well marked, dusky-black, postdiscal, diffuse band; cell of the fore wing traversed by three slender, longitudinal, black lines. *Underside*: the yellow and vermillion tints brighter than in the male. Expanse: 86-90mm.

Larva.—Colour dull blue-green. Head and all the segments dotted with minute blue tubercles, those on the head and sides black-tipped; dorsal surface pubescent; a lateral fringe of soft white hairs below the spiracles.

Pupa.—"Bright green. Sharply pointed at the head, with two strong lateral points and keeled on dorsal surface of thoracic segments; an interrupted, yellow, dorsal line, and a short, curved, crimson line on each side below thoracic segments bordering a small, white, irregular, black-speckled spot." (*E. E. Green, MS. note as quoted by Moore.*)

This description has been taken from Bingham's *Butterflies in the Fauna of British India*. In another pupa obtained in the Kanara District of the Bombay Presidency there was no sign of the crimson-bordered, black-speckled spot. It was very like the pupæ of the *Appias* (v. Pl. 1, fig. 18a) genus only larger and stouter. The butterfly is certainly not ever found in the plain country but will be met with at Mahableshwar hill-station in the Bombay Presidency and, may be, further north as far as Thana in the hilly jungles. It is extremely like *Delias eucharis* at first sight but has much more pointed wings and is a far faster and stronger flier; the red on the underside of hindwing is of a pinker tint and the whole insect is more aristocratic looking. It inhabits the big evergreen jungles of the Western



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Horace Knight, del.

Hentschel-Colourtype.

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EXPLANATION OF PLATE J.

- Fig. 64. *Catopsilia pyranthe*, ♂; 64 a, ♀.
,, 65. *Ixias pyrene*, ♂; 65 a, b, ♀ ♀.
,, 66. *Hebomoia australis*, ♂; 66 a, ♀.
,, 67. *Colotis etrida*, ♂; 67 a, ♀.
,, 68. ,, *amata*, ♂.

Ghats in Bombay and generally keeps to the very tops of trees, and the trees are very large and tall. On the hill tops, however, where there are huge boulders and rocks, often with the food-plant growing over them, *P. sita* may be found, in certain localities, within the radius of a long-handled net; but it is never an easy insect to catch. It is very quick at dodging and never flies slowly although it constantly, in such places, returns again and again over the same route. It appears about 8 o'clock in the morning and likes the sunshine; after 2 p.m. it disappears. It comes to damp places on roads and in nalla-beds in the hot days preceding the monsoon with *P. antiphates*, *P. doson* and others, and may then be most easily caught by dropping a net over the whole crowd; but the spots and times where the exact conditions that attract it exist, are not often met with and so it comes about that it is one of the most difficult insects to get. It will come to a decoy under the last conditions so that one may capture a certain number if fortunate in time and place. All thus captured are, however, males; the females neither fly round the hill-tops nor come to drink on the ground. They may occasionally be seen round the food-plants but even that is rare. The larva feeds upon Capers; it certainly will be found on *Capparis horrida* L. for the Kanara chrysalis above alluded to was found on a leaf of that climber. The distribution is Southern India and Ceylon. There are two other Indian species, *P. thestylis*, Dblday, with a wide distribution from Mussoorie to Sikkim in the Himalayas; Assam; Burma; Tenasserim and Siam; and *P. clemantha* from Sikkim, Butan, Assam, Burma, Tenasserim and Siam. All three are remarkably like species of *Delias*.

91. *Anaphaeis mesentina*. *Wet-season form.* Male *upperside*: white. Forewing: costa to base of vein 11 dusky black, thence continued in a jet-black, gradually widened, curved, short streak along the discocellulars to the lower apex of cell: apical area diagonally with the termen black, the former with six elongate, outwardly pointed spots of the ground colour enclosed one in each of the interspaces 3, 4, 5, 6, 8 and 9. Hindwing: uniform, the black along the venation on the underside seen through by transparency; termen between veins 2 and 6 somewhat broadly black, with a series of four round spots of the ground-colour in the interspaces; below vein 2 and above vein 6 the termen is very narrowly black. *Underside*: forewing white, marking similar, more clearly defined, the white spots within the black apical area larger. Hind wing: yellowish-white, all the veins very broadly bordered with black; interspaces 1, 2, 6 and 7 with cross bars of black, beyond which there is a subterminal, somewhat broad, transverse band of black, between veins 2 and 6. Cilia of both fore and hindwings white alternated with black. The ground-colour on both upper and undersides variable, often cream-coloured above; beneath: in some specimens, the base of cell and the elongate spots in apical area of fore-

wing and the whole surface of the hind wing varies to rich chrome-yellow. Female similar; the black markings on both upper and undersides broader, the white spots on black apical area of forewing often sub-obsolete above. Antennæ in both sexes black, sparsely sprinkled with white dots; head, thorax and abdomen above and below white; thorax above often bluish grey. *Dry-season form.* Male and female: similar to male and female of wet-season form, but on the upperside the black markings are narrower, the white markings on the black apical area of forewing broader and longer, and on the hindwing the narrow inner margining to the black on the termen very narrow, somewhat obsolescent; therefore, the white subterminal spots have the appearance of opening inwards. *Underside:* ground colour almost pure white; on the hindwing slightly tinged with yellow. Antennæ, head, thorax and abdomen as in the wet-season form. Expanse: 42-62mm.

Egg.—Is of the usual type of pierid egg, cylindrical with a domed top, twice as high as broad, the dome truncated in a small circle at apex where the 12 meridional ridges, triangular in tranverse section, meet in a thickened ring, their extremities hardly forming teeth round it or on it: the surface is shiny and finely, transversely striated both on the ridges and intervening parts. Colour white when laid, turning orange. L.: .5mm; B: about .25 mm.

Larva.—The first stage of the little larva has the head black and shiny, set with long, white hairs; the colour of the body is oily yellowish-green and there is a dorsolateral hair to each segment carrying a globule of liquid at its tip; the anal end is reddish.

The second stage is very much the same as the first in colour of head and body and everything except size which is of course somewhat larger.

The third stage has the head black, shiny with a bright yellow, triangular clypeus and it is set all over with white bristles proceeding from minute tubercles. The body is cylindrical and has the usual subdorsal, dorsolateral, supraspiracular tubercles as well as one subspiracular, each bearing an erect bristle at its tip. Body green with a broad, supraspiracular, purple-brown band.

Fourth stage.—Head shiny black with rather long, erect hairs which are either white or the colour of the head; a yellow line bordering the clypeus distinct. Anal segment rounded in outline, though inclined to be square-ended, about as long as broad, only slightly convex dorsally, with two yellow, vitreous tubercles, one on each side of dorsal line. Body surface oily-looking with the usual tubercles, subdorsal, dorsolateral and supraspiracular, yellow, vitreous and conical, each bearing a short, brown hair which may exude a globule of liquid from its tip; there is a subspiracular tubercle, bearing a longish white hair, as large as these; besides these main tubercles there are many minute ones, each bearing a short, fine,

white hair; there is a subspiracular fringe of rather long, fine, white hairs which is, however, not very thick. Spiracles broadly round, not large, light with a raised, shiny, thin, brown border. Colour of body greenish ochreous, with a broad supraspiracular band mottled with white, the region below it white enamelled with blotches of green, brown and yellow; there is a dorsal, double green line.

When the larva is full-grown it has the head very dark purplish with a moderately large, rather narrowly triangular, greenish clypeus bordered inside narrowly purple, outside broadly green; surface of head shiny, rough with many tubercles, mostly white, all rather small except a subdorsal one just below vertex and a dorsolateral one about the same height as the apex of clypeus and one near base which are larger and vitreous-yellow; all bear white hairs, the larger ones longer hairs than the rest; labrum, ligula, eyes and second antennal joint whitish; basal antennal joint green. Surface of body as in the last stage, the main tubercles perhaps slightly less conspicuous, each bearing a short, brown, cylindrical hair hardly longer than the numerous lesser white ones which are practically the same as in the last stage also. Spiracles not large, flush, oval, light with a thin, shiny, brownish, slightly raised border, those of segments 2 and 12 larger than the rest. Colour much as in last stage, the purple band only dotted with the little white tubercles; the region below it greenish mottled brown; the base of prolegs purplish, the feet lobed, light greenish like ventrum; the true legs the same with purple patch on basal part; the broad, green-ochreous, dorsal colour finishes square at the hinder margin of segment 12 or nearly so. L: 35 mm.; B: 4mm.

Pupa.—The pupa is somewhat of the type of the *Appias-huphina* lot although the points are not quite so prominent and the dorsal parts of the segments that bear them are not so flattened. The body is thickest at middle; the 7th segment is swollen at the anterior margin very slightly and runs out over spiracle laterally into a triangular, very prominent, sharp tooth which is flattened above and below and curved up a good deal, it bears the spiracle on its lower surface in its posterior basal angle; the thorax is carinated highly in its dorsal line and the apex of the carination, a little behind the middle of thoracic length, is the highest part of pupa, whence the dorsal line slopes anteriorly to segment 2 and posteriorly to segment 5. The vertex of head is in a plane only slightly inclined towards longitudinal axis of pupa, is short and with the eyes on each side is as broad as segment 2; frons is produced out into a curved-up snout, from a conical base as broad as half the breadth of front of pupa, soon thinning to $\frac{1}{3}$ rd of that, then more or less parallel-sided, suddenly constricted shortly before the blunt tip; this snout is as long as segment 2. Segment 2 is carinated in dorsal line though much less than the thorax, is rather convex transversely and has the front margin with a dorsal sinus, the hinder

margin straight and slopes up towards thorax at a small angle. The thorax is very convex, not long, highly carinated as already mentioned in dorsal line, the hinder margin a gentle curve meeting the wing-line in a largely-rounded, open angle of rather less than 90° . There is a slight constriction between thorax and abdomen dorsally, none laterally. The pupa at shoulders is broader than at the hinder margin of segment 2, and slightly tuberculate, after which the breadth of the body gradually decreases up to base of the lateral tooth on segment 7; after this it again decreases gradually to cremaster; the keel of the thorax runs into the dorsal line of segment 4; the ventral line of pupa is only slightly curved along suture-line of wings towards apices of these, the ventral line of snout of head is in a higher though parallel plane to the rest. The cremaster is square, forming, as usual, the end of segment 13; which is trapeze-shaped: the former has strong extensor ridges dorsally, ending behind in little knobs, the suspensory booklets being at the extremity between the knobs; the ventral ridges are curved towards each other. The surface of pupa is finely transversely impressed-lined, mostly very irregularly so though fairly closely; on the thorax and front segments the lines are in all directions; the membranes (intersegmental) between segments 8, 9 and 10 are broadly exposed; the subdorsal and supraspiracular tubercles of larva exist here as conspicuous, small, nearly hemispherical bosses on all segments but bear no hairs; the dorsolateral ones are less prominently indicated at hinder margin of segments; the antennæ reach end of wings. The spiracles of segment 2 are indicated by a rounded slight thickening in a curve of front margin of segment 3, rather long and smooth; others are white, broadly oval, of medium size, with a fine, brown border, slightly raised; there are short, fine hairs round eyes and on head vertex only. The colour of pupa is green with a faint supraspiracular band representing those of the larva; top of thoracic carina is black behind, yellowish in front; end of snout is yellow, the sides are black as also shoulder points and teeth of segment 7; tubercles all black; abdomen tinged yellow; wings marked with black; the surface of abdomen is also pitted. Sometimes the pupa is greyish bone-coloured and then the tubercles are bright orange-yellow. L: 23mm.; B: 26mm.

Habits.—The eggs are laid in clusters up to 200 in a batch on the young shoots or the undersides of young leaves; the larvæ eat their way out near the top as a rule and as often as not do not eat the egg-shell; they herd together during the first stages but separate in the last, feeding all the time on the young succulent parts of the plant; they eat voraciously and grow rapidly like all the others of the family. The pupation often takes place in company, one close up against the other on a perpendicular

surface or horizontal, on the upperside or underside of a leaf or against a stone or tree-trunk indiscriminately. The fixture is strong at the tail and the body-band is short. The females of a brood emerge before the males. The butterfly is a fairly strong flier and keeps to open places and the hot sunshine; it flies low and is fond of resting on the ground with its wings closed over its back and, in dull weather, the upper wings drawn down between the lower ones. As may be imagined from the number of eggs laid in a single batch, the perfect insects are very numerous wherever they exist, notwithstanding the fact that the larvæ are so subject to parasitic attack. It is an insect of the plains and dry regions more particularly, although it exists up to 6,000 feet elevation in the Himalayas and 8,000 feet in the Nilgiris; it is not uncommon near the sea-coast in Kanara where the rainfall is over 100 inches. Its food-plants are all Capers and it has been bred on *Capparis aphylla*, *C. sepiaria*, *C. heyeana*, *Cadaba indica* and *Mærua arenaria*, the latter two species also belonging to the *Capparideæ*. Its distribution is the Himalayas from Kashmir to Sikhim up to 6,000 feet, and through the plains to Southern India; one specimen is recorded as having been caught in Great Nicobar Island, though it has not been recorded from Burma or Assam; in the west through Persia to Arabia and Africa. There is one form of the insect which by some is considered another species, *A. taprobana*, Moore, that occurs in Ceylon, in which the male resembles the female of the typical form and the female has the whole apical area of the forewing black; in both sexes the underside of hindwing has the ground-colour, a rich chrome-yellow.

NOTES ON A BIRD COLLECTING TRIP IN THE BALAGHAT DISTRICT OF THE CENTRAL PROVINCES.

BY

E. A. D'ABREV, F.Z.S.

Early in January 1912, I had the good fortune to be deputed to collect birds in the Balaghat District for the Nagpur Museum. The express purpose of the expedition was to secure such specimens as were not represented in the Museum and accordingly no wholesale slaughter of birds was indulged in, only such specimens were shot as were needed.

A list of the birds seen and identified with certainty is given, but this cannot be considered complete, for only a part of the district was traversed and that very hurriedly.

The District of Balaghat lies to the north-east of Nagpur. It is bounded on the north by the Mandla District, on the south by the Bhandara District, west by Seoni and east by the districts of Bilaspur and Drug. It is mostly hilly except for the valleys of the Wainganga and the Banjar. To the north-east is the Topla Plateau. Heavy forests are plentiful and large quantities of timber exported. Other industries appear to be mainly agricultural, and cattle-rearing is carried on in some parts. Manganese ore is plentiful and there are several companies excavating it.

The party consisted of five : myself, a fieldman, two peons, one of whom was kindly lent to us by the Forest Department, and a cook. Before beginning this account I would like to mention that this is the first time I have collected in the Central Provinces and I had absolutely no knowledge of the country. Country carts were available in most places and these formed our mode of conveyance from one stage to another.

The party left Nagpur on the morning of the 3rd and reached Balaghat in the afternoon ; here we found carts and the Forest Officer's shooting *chakra* waiting for us. A *chakra* is a bullock cart built on a very light scale, suitable to seat one or two persons at the most. This *chakra* differed a great deal from the common ones used by the natives ; there was a hood to it and the seat was in the form of a chair and on either side of it was a rack to rest one's guns in. A common practice in the Central Provinces is to shoot from off a bullock cart, antelope and such like are so used to seeing these vehicles pass near them that they have lost all fear of them and the sportsman is able to get well within range which most probably he could not do on foot. Carts can also be used in forests if the ground is not very uneven and the forest not too dense ; moreover most forests have cart roads running through them.

On our arrival at Balaghat station we proceeded to the Dak Bungalow

for the night and that very evening collected our first specimen, a Black-headed Oriole (*Oriolus melanocephalus*). This bird and the Indian Oriole (*O. kundoo*) are the common orioles of the Central Provinces. At Nagpur *O. kundoo* is common while *O. melanocephalus* is rare, but in this district the reverse seems to be the case. *O. melanocephalus* is common everywhere while *O. kundoo* was only met with at Baihar.

The next day a move was made to the Tikari Inspection Hut, a distance of seven miles from Balaghat. Here we were near the hills and close to heavy forest. The Bungalow is between the villages of Pipartola and Tikari; a nullah runs along the side of the Bungalow and close to the Tikari village is a large jheel which we visited the next morning. As we approached it a large flock of Painted Storks were visible on a tree on the other side of the jheel, Egrets of two or three species studded the edges, their white plumage showing distinctly among the green surroundings, a Darter or two were seated on adjoining trees and the usual set of waders (Hérons, Sandpipers, etc.) were to be seen here and there in all directions but no ducks were visible.

We decided to begin with the Painted Storks, but they flew off in a body on my approach to a tree on the other side of the jheel. I attempted to follow but in a bend of the jheel came across an Adjutant Stork feeding all by himself. He was more of a prize to me, being the first one I had set eyes on in the Central Provinces, but before I could put in a cartridge suitable to his size, he was off and perched himself on a distant tree. He was followed up but would not allow me to get within range. In the meantime his painted brethren had also made themselves scarce but we consoled ourselves with the hope of shooting them later on. We returned to the bungalow working our way along the nullah; here we secured specimens of Tickell's Flowerpecker (*Dicaeum erythrorhynchus*) and a Jungle Owlet (*Glaucidium radiatum*). The latter seemed quite awake although it was midday. Near the nullah we saw a troop of about fifty monkeys (*Presbytis entellus*), most of them were squatting on the ground and gave one the impression of labourers working in a field. They showed no fear of us and when a gun was levelled at them they did not seem to know the meaning of it. None were shot as we did not want them. We visited the same spot the next day and we found the monkeys still on the same ground. I made it a point to visit the spot every day and to my surprise I found them on the same spot for six days. In the afternoon shots were fired at some White-necked Storks but none were bagged. The next morning we visited the jheel again and the Painted Storks were on the same tree they had occupied the day before. This time I sent my fieldman for them with instructions to fire if he got well within range, while I hid against the tree they made for yesterday. To my delight they went through the same tactics they did before, but instead of settling straight away, they took it

into their heads to fly in a circle round the tree, prior to settling. It was all up, a long shot was chanced, a few feathers fell to the ground and the storks betook themselves to pastures new. We did the same. I made a bee line for the forest country while the fieldman consoled himself with a Brahminy Kite and made for the Bungalow, shooting *en route* a pair of Greenshanks and a Black Vulture. In the forest country I secured a pair of Rose Finches, a Crested Goshawk and a large Cuckoo-Shrike. The Rose Finch is a migratory bird with us, the hen is a plain bird resembling a hen-sparrow while the cock is of a beautiful rose tint. It is a common cage bird in parts of India, especially in Behar, where it is termed the Tuti. They never seem to survive through the warm weather. On my return to the bungalow at about 1 p.m. a smell seemed to pervade the whole place and the vulture was pointed out to me as the source of the same. There was no getting away from it, it could be perceived in all the rooms, even the breakfast that day had a taint of it. However the bird had to be dealt with, but it took us some time to make up our minds to skin it, nevertheless we had his skin off by sunset but we took care to sprinkle some spirit over him to deaden the smell. We had him fixed up before noon the next day and his carcass was thrown away and it was not long before the crows spotted it and this attracted the kites and other vultures. As there were no vultures in the museum we decided to finish off with them as we were about it, so a white-backed one (*Pseudogyps bengalensis*) was shot. It dropped into a nullah and while I was hunting for it a crowd of servants came calling for me saying that the 'burra saheb' wanted to see me. This was the Deputy Commissioner who was passing through and hearing the crack of my gun came to see what I had shot. He was much interested in natural history and examined with keenness the specimens I had already collected, moreover, he very kindly offered to help the expedition, an offer which was heartily accepted. Our second vulture did not smell so bad as the first and on close inspection looked quite a handsome bird; his bill was of a fine bluish tint, his neck was grey, his back spotlessly white and his black underparts were striated with white, while round his neck was a collar of white down.

The jheel was visited again the next day but it was deserted, only a Darter and another bird were sitting on the trees patronised by the storks. The Darter soon made himself scarce but we bagged the other bird which turned out to be the Little Cormorant (*Phalacrocorax javanicus*).

Our attention was now exclusively devoted to the forest country. Sambhar, spotted deer and wild pig were very plentiful and we frequently disturbed them as we shot at small birds with our 'fourten.' Once I shot at a minivet and a pig jumped up a few feet from the place I stood. We came across the pugs of bears and panthers but never saw any in the flesh. One evening we disturbed a spotted deer with a very good head and that

very evening came across a pig lying down. I pointed it out to the forest guard who was with me at the time but he insisted on its being a log of wood till piggy took to his heels. We secured for ourselves a Chestnut-bellied Nuthatch and a pair of Scarlet Minivets (*Pericrocotus speciosus*); the cock is a scarlet and black bird while the hen is yellow and grey. Strange to say, the cock minivet, the moment he saw me, flew to a tree with red leaves and I have often noticed on the Himalayas *P. brevirostris*, a bird similarly coloured, do the same. Can this be an instance of protective coloration?

Our last day at Tikari was almost a blank; only a Pale Harrier was collected, but a bird resembling the Nilgiri Thrush was seen in the forest country.

Leaving Pipartola, a move was made to Somnapur, passing Laughur *en route*. Laughur is on the hills at an altitude of 1,933 feet; it is a great place for big game shooting. After we had passed Laughur, we saw Peafowl, Jungle Fowl and Spotted Deer on the road. Once we heard the screeches of birds resembling the call of the Malabar Pied Hornbill and attempts were made to secure them, but they were not seen. Along the roadsides lizards of the families *Agamidae* and *Scincidae* were plentiful and I recognised *Mabuia carinata* and *M. macularia* amongst them. The Southern Red-whiskered Bulbul, Sunbirds, White-eyes, Paradise and Grey-headed Flycatchers were very common at Laughur.

We reached Somnapur at night and next morning the forests near the bungalow were visited. Some sambhar and monkeys were seen but nothing of special interest in the bird line. In the afternoon we had better luck, a jheel was visited and an Egret, some Whistling Teal and a pair of Little Ringed *vers* secured. A Redshank and some Jacanas were seen.

On visiting the jheel the next day an Adjutant and a Heron were seen seated on a tree. On my approach the Stork took to his wings but I secured the Heron which proved to be the Common Heron (*Ardea cinerea*). The Jacanas were again seen and to my delight I shot one which rolled over apparently hard hit. The Chaprassi waded for it while I moved on towards the end of the jheel after some other birds and on my return he declared the Jacana could not be found. On my way home a Pale Harrier was shot; it was observed following a pariah dog and sitting down near it whenever the dog sat down. When about two miles from the bungalow, a large Stork suddenly flew up from a ditch and sat on a tree. It was shot and turned out to be the Lesser Adjutant (*Leptoptilus javanicus*). Somnapur is a great place for small birds, the trees round the bungalow simply swarmed with them, Bhimrajas (Rackettailed Drongos) Mynas, Babblers, Hornbills. Koopoes, Barbets, Woodpeckers, Parakeets, Bee-eaters, Doves, Flycatchers, Wagtails, Bulbuls, Tits, Mini-

vets, Shrikes, Kingcrows, Sunbirds, Pipits, all were plentiful, while Peafowl and Red Jungle Fowl were seen in greater numbers than elsewhere. In the course of our rambles we came across a large flock of Jungle Fowl in an open glade. We did not get a shot but we noticed that near the place where the fowls were, there was a sort of 'machan.' This we made use of the next day and at precisely the same time the birds came out, but they were out of range though moving towards us. A cock bird came well within range, but we wanted a hen, so we waited, but some cattle passing through the glade drove the birds away. We waited, nevertheless, in the hope that they may appear again, and as it got dusk, the Nightjars began to utter their cries and the air was alive with them. From their sizes they appeared to belong to three different species. One that flew close to us was shot and turned out to be Horsfield's Nightjar (*C. macrurus*). Among other birds collected here were the White-browed Blue Flycatcher, the Pigmy Woodpecker, the White-eyed Buzzard-Eagle, the Pale Harrier, the Common Snipe, the Western Blossom-headed Parakeet and the Large Indian Parakeet.

A Crested Serpent Eagle (*Spilornis cheela*) was also shot by mistake. If there is an eagle that baulks the collector it is this species. He has many phases of coloration and I have got him in every phase in the Nagpur Museum, so do not wish to have anything more to do with him; yet he will come in my way. If I see an eagle the identity of which is uncertain and shoot it accordingly, it is bound to be a Cheela. On the other hand if I spare a bird thinking it to be a Cheela, it is bound to turn out something else. Parakeets of three species were very plentiful all over the district; these were the Rose-ringed Parakeet, the Western Blossom-headed Parakeet and the Large Indian Parakeet, but the Blossom-headed Parakeet far outnumbered the other two. Of Doves five species were noticed, namely the Spotted Dove, Ring Dove, Little Brown Dove, Rufous Turtle Dove and the Red Turtle Dove. The Spotted Dove far outnumbered the others at Pipartola and Somnapur; while at Baihar, Muki and on the plateau the Ring Dove predominated and at Paraswara the Rufous-Turtle Dove was seen in greater numbers than elsewhere. The Rufous-backed Shrike appears to be the common Shrike of the district for we noticed him everywhere; the Bay-backed Shrike was only seen in numbers between Pipartola and Balughat.

From Somnapur we moved on to Muki *via* Baihar. The country between Baihar and Muki is not hilly, nor are the forests dense. Two large streams were crossed, the Tonaar near Baihar and the Banjar near Muki. Black Buck, Green Pigeons and a few Harriers were about, the only things seen on the road. From Muki we journeyed on towards the Topla plateau and after ascending the ghaut the country gradually opened out into an undulating plain almost devoid of trees. A Crested Hawk-Eagle was shot

near the ghaut and further on large numbers of Coursers were seen and a few secured.

Parsatola was reached at about 2 p. m. Here we were in an open plain covered with spear grass. Cattle rearing seemed to be the chief occupation of the people, for large herds were seen in all directions. Black Buck and Nilghai were plentiful and the latter might have afforded some excellent runs for a mounted spearman, for the country was suitable in every way. Foxes and Hares were also found and I was told that a Cheeta inhabited the place. The first thing seen next morning was a Fox, it was eventually shot and turned out to be the Common Indian Fox (*Vulpes bengalensis*).

On the 22nd nothing in particular was shot, some Black Ibis, Stone-curlews and a small dark-coloured species of Quail were seen. Attempts were made to shoot some Saruses, but without success, and I had to content myself with a Rufous Fantail-Warbler (*Cisticola cursitans*).

We returned from Parsatola on the 23rd, shooting some Green Pigeons on the way, but they turned out to be the ordinary ones (*Crocopus chlorogaster*). As we neared the hills Nilghai were very plentiful, and a bull which appeared to have a good pair of horns was shot, but they only taped 7.5 and 8 inches. Towards Baihar flocks of peafowl were seen and at dusk a Four-horned Antelope was shot on the roadside. It was not a perfect specimen, the anterior horns were mere knobs and the posterior ones measured 2.8 inches. At Baihar a large Bandicoot Rat (*Nesocia bandicota*) was picked up on the road. It measured about 1 foot 9 inches. From Baihar to Paraswara the country is more or less open except near Sitadongra where it is hilly. Jheels were visited on the way but only Teal of the ordinary kind (*Nettion crecca*) were seen on the first two. The next one seemed more interesting, two White-necked Storks, a Painted Stork and some Herons were in evidence at one end and a flock of White Ibises and an Open-bill at the other. On my approach they all made themselves scarce, but the White-necked Storks were the last to leave and as they rose one was bagged. Further on we came across more White-necked Storks in a ditch on the road side and here they took no notice of us, though we were only a few yards from them. The next jheel contained a flock of Ibises and some Herons. A shot at the Ibises proved a failure but a large flock of Teal rose out of the rushes and among them were two ducks of a larger kind, the second barrel discharged into them only resulted in bringing a Teal to the ground. An Egret, probably of the lesser or larger species, was also shot at and fell to the ground, apparently stunned for when the peon went to pick it up it recovered and flew off.

At Paraswara we found Saruses very plentiful, but they were very shy and always flew off before we got within range.

On the 27th I visited a jheel about 3 miles from the bungalow. Four

young Black-necked Storks and a pair of Saruses were seen. Shots were fired at the Saruses in preference and one was evidently hit for he settled after flying a short distance; two more shots were had at him but without effect. The storks meanwhile had settled in some fields about a mile away. Some cover being available one was shot. The others hovered over it and an adult female bird came flying towards it. I was still well concealed and the contents of my second barrel brought her to the ground. On our way home two Black Buck ran quite close to us, but we had no rifle with us at the time.

On the 28th the jheel in front of the bungalow was patronised. Several Coots, Dabchicks and Bronze-winged Jacanas were seen and two of the latter and a Snipe were bagged. Species of Herons and Egrets which we wanted and a Pied Harrier were seen but not secured. We tried for these the next day but had to content ourselves with a Marsh Harrier. A pair of Saruses were again tried for, but with the usual result. Snipe and Quail were very plentiful here and a little shooting was indulged in. Five shots brought to bag seven birds. The Snipes were Fantails and Pintails and the Quails were black-breasted ones. On our way back Saruses were again seen, and this time I waited till it got dark and then tried to get within range, but it was of no avail.

Leaving Paraswara a move was made to Lamtha and the jheel at Bhondua visited. Ducks were seen in the middle of the jheel and Storks and Saruses at the edges. The Ducks being out of range we tried our luck again at Saruses but with the same result. At Lamtha we took train and returned to Nagpur.

LIST OF BIRDS OBSERVED IN THE BALAGHAT DISTRICT, CENTRAL PROVINCES.

ORDER PASSERES.

- | | | | |
|-----|--------------------------------|----|-------------------------------|
| 1. | <i>Corvus macrorhynchus</i> | .. | The Jungle-Crow. |
| 2. | <i>Corvus splendens</i> | .. | The Indian House-Crow. |
| 3. | <i>Dendrocitta rufa</i> | .. | The Indian Tree-pie. |
| 4. | <i>Machlolophus haplonotus</i> | .. | The Southern Yellow Tit. |
| 5. | <i>Argya caudata</i> | .. | The Common Babbler. |
| 6. | <i>Argya malcolmi</i> | .. | The Large Grey Babbler. |
| 7. | <i>Crateropus canorus</i> | .. | The Jungle Babbler. |
| 8. | <i>Pyctorhis sinensis</i> | .. | The Yellow-eyed Babbler. |
| 9. | <i>Zosterops palpebrosa</i> | .. | The Indian White-eye. |
| 10. | <i>Ægithina tiphia</i> | .. | The Common Iora. |
| 11. | <i>Chloropsis jerdoni</i> | .. | The Jerdon's Chloropsis. |
| 12. | <i>Molpastes hæmorrhous</i> | .. | The Madras Red-vented Bulbul. |

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| 13. | <i>Otocompsa fuscicaudata</i> | .. | The Southern Red-whiskered Bulbul. |
| 14. | <i>Sitta castaneiventris</i> | .. | The Chestnut-bellied Nuthatch. |
| 15. | <i>Dicrurus ater</i> | .. | The Black Drongo. |
| 16. | <i>Dicrurus caerulescens</i> | .. | The White-bellied Drongo. |
| 17. | <i>Dissemurus paradisens</i> | .. | The Larger Racket-tailed Drongo. |
| 18. | <i>Orthotomus sutorius</i> | .. | The Indian Tailor-bird. |
| 19. | <i>Cisticola cursitans</i> | .. | The Rufous Fantail-Warbler. |
| 20. | <i>Hypolais rama</i> | .. | Sykes's Tree Warbler. |
| 21. | <i>Prinia sylvatica</i> | .. | The Jungle Wren-Warbler. |
| 22. | <i>Prinia inornata</i> | .. | The Indian Wren-Warbler. |
| 23. | <i>Lanius vittatus</i> | .. | The Bay-backed Shrike. |
| 24. | <i>Lanius erythronotus</i> | .. | The Rufous-backed Shrike. |
| 25. | <i>Lanius cristatus</i> | .. | The Brown Shrike. |
| 26. | <i>Tephrodornis pondicerianus</i> | | The Common Wood-Shrike. |
| 27. | <i>Pericrocotus speciosus</i> | .. | The Indian Scarlet Minivet. |
| 28. | <i>Pericrocotus peregrinus</i> | .. | The Small Minivet. |
| 29. | <i>Pericrocotus erythropygius</i> | .. | The White-bellied Minivet. |
| 30. | <i>Campophaga sykesi</i> | .. | The Black-headed Cuckoo-Shrike. |
| 31. | <i>Graucalus macii</i> | .. | The Large Cuckoo-Shrike. |
| 32. | <i>Oriolus kundoo</i> | .. | The Indian Oriole. |
| 33. | <i>Oriolus melanocephalus</i> | .. | The Indian Black-headed Oriole. |
| 34. | <i>Pastor roseus</i> | .. | The Rose-coloured Starling. |
| 35. | <i>Sturnus menzbieri</i> | .. | The Common Indian Starling. |
| 36. | <i>Temenuchus pagodarum</i> | .. | The Black-headed Myna. |
| 37. | <i>Acridotheres tristis</i> | .. | The Common Myna. |
| 38. | <i>Sturnopastor contra</i> | .. | The Pied Myna. |
| 39. | <i>Siphia parva</i> | .. | The European Red-breasted Flycatcher. |
| 40. | <i>Cyornis superciliaris</i> | .. | The White-browed Blue Flycatcher. |
| 41. | <i>Cyornis tickelli</i> | .. | Tickell's Blue Flycatcher. |
| 42. | <i>Alseonax latirostris</i> | .. | The Brown Flycatcher. |
| 43. | <i>Culicicapa ceylonensis</i> | .. | The Grey-headed Flycatcher. |
| 44. | <i>Terpsiphone paradisi</i> | .. | The Indian Paradise Flycatcher. |
| 45. | <i>Rhipidura albifrontata</i> | .. | The White-Browed Fantail Flycatcher. |
| 46. | <i>Pratincola caprata</i> | .. | The Common Pied Bush-Chat. |
| 47. | <i>Pratincola maura</i> | .. | The Indian Bush-Chat. |
| 48. | <i>Ruticilla rufiventris</i> | .. | The Indian Redstart. |
| 49. | <i>Cyanecula suecica</i> | .. | The Indian Blue-throat. |
| 50. | <i>Thamnobia cambaiensis</i> | .. | The Brown-backed Indian Robin. |
| 51. | <i>Copsychus saularis</i> | .. | The Magpie-Robin. |

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|------|----------------------------------|----|-----------------------------------|
| 51A. | <i>Geocichla cyanonotus</i> | .. | The White-throated Ground-Thrush. |
| 52. | <i>Uroloncha malabarica</i> | .. | The White-throated Munia. |
| 53. | <i>Stictospiza formosa</i> | .. | The Green Munia. |
| 54. | <i>Sporæginthus amandava</i> | .. | The Indian Red Munia. |
| 55. | <i>Carpodacus erythrinus</i> | .. | The Common Rose-Finch. |
| 56. | <i>Gymnorhis flavicollis</i> | .. | The Yellow-throated Sparrow. |
| 57. | <i>Passer domesticus</i> | .. | The House-Sparrow. |
| 58. | <i>Hirundo smithii</i> | .. | The Wire-tailed Swallow. |
| 59. | <i>Motacilla alba</i> | .. | The White Wagtail. |
| 60. | <i>Motacilla maderaspatensis</i> | .. | The Large Pied Wagtail. |
| 61. | <i>Motacilla melanope</i> | .. | The Grey Wagtail. |
| 62. | <i>Anthus maculatus</i> | .. | The Indian Tree-Pipit. |
| 63. | <i>Anthus striolatus</i> | .. | Blyth's Pipit. |
| 64. | <i>Anthus refulus</i> | .. | The Indian Pipit. |
| 65. | <i>Mirafra erythroptera</i> | .. | The Red-winged Bush-Lark. |
| 66. | <i>Ammomanes phœnicura</i> | .. | The Rufous-tailed Finch-Lark. |
| 67. | <i>Pyrrhulauda grisea</i> | .. | The Ashy-crowned Finch-Lark. |
| 68. | <i>Arachnechthra asiatica</i> | .. | The Purple Sunbird. |
| 69. | <i>Dicæum erythrorhynchus</i> | .. | Tickell's Flower-pecker. |
| 70. | <i>Pitta brachyura</i> | .. | The Indian Pitta. |

ORDER PICI.

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|-----|--------------------------------|----|--------------------------------------|
| 71. | <i>Liopicus mahrattensis</i> | .. | The Yellow-fronted Pied Wood-pecker. |
| 72. | <i>Iyngipicus hardwickii</i> | .. | The Indian Pigmy Woodpecker. |
| 73. | <i>Brachypternus aurantius</i> | .. | The Golden-backed Woodpecker. |

ORDER ZYGODACTYLI.

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|-----|---------------------------------|----|--------------------------------|
| 74. | <i>Thereiceryx zeylonicus</i> | .. | The Common Indian Green Barbet |
| 75. | <i>Xantholæma hæmatocephala</i> | .. | The Crimson-breasted Barbet. |

ORDER ANISODACTYLI.

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|-----|-----------------------------|----|--------------------------------|
| 76. | <i>Coracias indica</i> | .. | The Indian Roller. |
| 77. | <i>Merops viridis</i> | .. | The Common Indian Bee-eater. |
| 78. | <i>Ceryle varia</i> | .. | The Indian Pied Kingfisher. |
| 79. | <i>Alcedo ispida</i> | .. | The Common Kingfisher. |
| 80. | <i>Halcyon smyrnensis</i> | .. | The White-breasted Kingfisher. |
| 81. | <i>Lophoceros birostris</i> | .. | The Common Grey Hornbill. |
| 82. | <i>Upupa indica</i> | .. | The Indian Hoopoe. |

ORDER MACROCHIRES.

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|-----|-----------------------------|----|--------------------------|
| 83. | <i>Cypselus affinis</i> | .. | The Common Indian Swift. |
| 84. | <i>Caprimulgus macrurus</i> | .. | Horsfield's Nightjar. |

ORDER COCCYGES.

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|-----|---------------------------|----|-------------------------------------|
| 85. | <i>Hierococcyx varius</i> | .. | The Common Hawk-Cuckoo. |
| 86. | <i>Eudynamis honorata</i> | .. | The Indian Koel. |
| 87. | <i>Centropus sinensis</i> | .. | The Common Coucal or Crow-Pheasant. |

ORDER PSITTACI.

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|-----|--------------------------------|----|--------------------------------------|
| 88. | <i>Palæornis nepalensis</i> | .. | The Large Indian Paroquet. |
| 89. | <i>Palæornis torquatus</i> | .. | The Rose-ringed Paroquet. |
| 90. | <i>Palæornis cyanocephalus</i> | .. | The Western Blossom-headed Paroquet. |

ORDER STRIGES.

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|-----|----------------------------|----|-------------------------|
| 91. | <i>Scops bakkamœna</i> | .. | The Collared Scops Owl. |
| 92. | <i>Athene brama</i> | .. | The Spotted Owlet. |
| 93. | <i>Glaucidium radiatum</i> | .. | The Jungle Owlet. |
| 94. | <i>Ninox scutulata</i> | .. | The Brown Hawk-Owl. |

ORDER ACCIPITRES.

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|------|---------------------------------|----|--------------------------------------|
| 95. | <i>Otogyps calvus</i> | .. | The Black Vulture. |
| 96. | <i>Pseudogyps bengalensis</i> | .. | The Indian White-backed Vulture. |
| 97. | <i>Neophron ginginianus</i> | .. | The Smaller White Scavenger Vulture. |
| 98. | <i>Aquila vindhiana</i> | .. | The Indian Tawny Eagle. |
| 99. | <i>Spizæetus cirrhatus</i> | .. | The Crested Hawk-Eagle. |
| 100. | <i>Spilornis cheela</i> | .. | The Crested Serpent-Eagle. |
| 101. | <i>Butastur teesa</i> | .. | The White-eyed Buzzard-Eagle. |
| 102. | <i>Haliastur indus</i> | .. | The Brahminy Kite. |
| 103. | <i>Milvus govinda</i> | .. | The Common Pariah Kite. |
| 104. | <i>Elanus cœruleus</i> | .. | The Black-winged Kite. |
| 105. | <i>Circus macrurus</i> | .. | The Pale Harrier. |
| 106. | <i>Circus melanoleucus</i> | .. | The Pied Harrier. |
| 107. | <i>Circus æruginosus</i> | .. | The Marsh Harrier. |
| 108. | <i>Astur badius</i> | .. | The Shikra. |
| 109. | <i>Lophospizias trivirgatus</i> | .. | The Crested Goshawk. |
| 110. | <i>Pernis cristatus</i> | .. | The Crested Honey-Buzzard. |
| 111. | <i>Tinnunculus alaudarius</i> | .. | The Kestrel. |

ORDER COLUMBÆ.

- | | | | |
|------|---------------------------------|----|----------------------------|
| 112. | <i>Crocopus chlorogaster</i> | .. | The Southern Green Pigeon. |
| 113. | <i>Turtur suratensis</i> | .. | The Spotted Dove. |
| 114. | <i>Turtur cambayensis</i> | .. | The Little Brown Dove. |
| 115. | <i>Turtur risorius</i> | .. | The Indian Ring Dove. |
| 116. | <i>Turtur orientalis</i> | .. | The Rufous Turtle-Dove. |
| 117. | <i>Ænopopelia tranquebarica</i> | .. | The Red-Turtle-Dove. |

ORDER GALLINÆ.

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|------|----------------------------------|----|----|---------------------------|
| 118. | <i>Pavo cristatus</i> | .. | .. | The Common Peafowl. |
| 119. | <i>Gallus ferrugineus</i> | .. | .. | The Red Jungle-fowl. |
| 120. | <i>Coturnix coromandelica</i> | .. | .. | The Black-breasted Quail. |
| 121. | <i>Francolinus pondicerianus</i> | .. | .. | The Grey Partridge. |

ORDER GRALLÆ.

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|------|---------------------------|----|----|-----------------------|
| 122. | <i>Fulica atra</i> | .. | .. | The Coot. |
| 123. | <i>Grus antigone</i> | .. | .. | The Sarus. |
| 124. | <i>Anthropoides virgo</i> | .. | .. | The Demoiselle Crane. |

ORDER LIMICOLÆ.

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|-------|---------------------------------|----|----|-----------------------------|
| 125. | <i>Œdicnemus scolopax</i> | .. | .. | The Stone-Curlew. |
| 126. | <i>Cursorius coromandelicus</i> | .. | .. | The Indian Courser. |
| 127. | <i>Metopidius indicus</i> | .. | .. | The Bronze-winged Jacana. |
| 128. | <i>Hydrophasianus chirurgus</i> | .. | .. | The Pheasant-tailed Jacana. |
| 129. | <i>Sarcogrammus indicus</i> | .. | .. | The Red-wattled Lapwing. |
| 130. | <i>Ægialitis dubia</i> | .. | .. | The Little Ringed Plover. |
| 131. | <i>Himantopus candidus</i> | .. | .. | The Black-winged Stilt. |
| 132. | <i>Totanus hypoleucus</i> | .. | .. | The Common Sandpiper. |
| 133. | <i>Totanus glareola</i> | .. | .. | The Wood Sandpiper. |
| 134. | <i>Totanus ochropus</i> | .. | .. | The Green Sandpiper. |
| 135. | <i>Totanus fuscus</i> | .. | .. | The Spotted Redshank. |
| 136. | <i>Totanus glottis</i> | .. | .. | The Greenshank. |
| 137. | <i>Gallinago cœlestis</i> | .. | .. | The Common Snipe. |
| 137a. | <i>Gallinago stenura</i> | .. | .. | The Pintail Snipe. |

ORDER STEGANOPODES.

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|------|----------------------------------|----|----|-----------------------|
| 138. | <i>Phalacrocorax fuscicollis</i> | .. | .. | The Indian Shag. |
| 139. | <i>Phalacrocorax javanicus</i> | .. | .. | The Little Cormorant. |
| 140. | <i>Plotus melanogaster</i> | .. | .. | The Indian Darter. |

ORDER HERODIONES.

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|------|-------------------------------------|----|----|---------------------------|
| 141. | <i>Ibis melanocephala</i> | .. | .. | The White Ibis. |
| 142. | <i>Inocotis papillosus</i> | .. | .. | The Black Ibis. |
| 143. | <i>Dissura episcopus</i> | .. | .. | The White-necked Stork. |
| 144. | <i>Xenorhynchus asiaticus</i> | .. | .. | The Black-necked Stork. |
| 145. | <i>Leptoptilus dubius</i> | .. | .. | The Adjutant. |
| 146. | <i>Leptoptilus javanicus</i> | .. | .. | The Smaller Adjutant. |
| 147. | <i>Pseudotantalus leucocephalus</i> | .. | .. | The Painted Stork. |
| 148. | <i>Anastomus oscitans</i> | .. | .. | The Open-bill. |
| 149. | <i>Ardea manillensis</i> | .. | .. | The Eastern Purple Heron. |
| 150. | <i>Ardea cinerea</i> | .. | .. | The Common Heron. |
| 151. | <i>Herodias intermedia</i> | .. | .. | The Smaller Egret. |

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|------|----------------------------|----|---|
| 152. | <i>Herodias garetta</i> | .. | The Little Egret. |
| | <i>Herodias alba</i> | .. | The Large Egret is probably found
in the District as well. |
| 153. | <i>Bubulcus coromandus</i> | .. | The Cattle Egret. |
| 154. | <i>Ardeola grayi</i> | .. | The Pond Heron. |

ORDER PHENICOPTERI.

No flamingoes were seen by me but I was told that they were occasionally to be met with at Somnapur.

ORDER ANSERES.

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|------|---------------------------------|----|---------------------|
| 155. | <i>Dendrocyena javanica</i> | .. | The Whistling Teal. |
| 156. | <i>Nettopus coromandelianus</i> | .. | The Cotton Teal. |
| 157. | <i>Chaulelasmus streperus</i> | .. | The Gadwall. |
| 158. | <i>Nettium crecca</i> | .. | The Common Teal. |
| 159. | <i>Dafila acuta</i> | .. | The Pintail. |

ORDER PYGPODES.

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|------|-----------------------------|----|---------------|
| 162. | <i>Podicipes albipennis</i> | .. | The Dabchick. |
|------|-----------------------------|----|---------------|

BOMBAY NATURAL HISTORY SOCIETY'S
MAMMAL SURVEY OF INDIA.

REPORT BY R. C. WROUGHTON, F.Z.S.

COLLECTION	...	...	No. 5.
LOCALITY	...	...	Dharwar.
DATE	...	...	November-December 1911, February-March 1912.
COLLECTED BY...	...	...	Mr. G. C. Shortridge.
EARLIER REPORTS	...	...	No. 1, E. Khandesh, Vol. XXI, p. 392. No. 2, Berars, Vol. XXI, p. 820. No. 3, Cutch, Vol. XXI, p. 826. No. 4, Nimar, Vol. XXI, p. 844.

Dharwar, the district in which the present collection was made, is situated about $15^{\circ} 30'$ N. Lat. and 76° E. Long. At the commencement of the last century Sir W. Elliot, I.C.S., collected the mammals of this district and published a paper on them in the Madras Journal of Literature and Science, 1839. As a description of the district I cannot do better than reproduce here the Introduction to his paper.

"The district of India, in which the animals contained in the following list were procured, is a part of the high tableland towards the south of the Dekkan, commonly called the Southern Mahratta Country, and constitutes the British zillah of Dharwar. It ought, likewise, geographically speaking, to include the small province of Sunda, which, according to the political arrangement of the country, is placed under the zillah of Canara, in the Presidency of Madras."*

"The general boundaries are the rivers Kistnah and Bhima on the north and north-east; the Tungabhadra river on the south; the Nizam's territory on the east, and the Syhadri range of mountains on the west. The latter are generally called the Ghats."

* Since this description was published the boundary of the Dharwar District has been pushed back eastwards and the area referred to in this para. is now part of the Kanara District which will be dealt with in my next Report—R. C. W.

“The general face of this tract is much diversified and affords a great variety of elevation and of geological structure thereby materially affecting the distribution and the habitat of the different species of animals existing within its limits.”

“The whole of the western portion is a thick forest, extending from the outskirts of the mountainous region of the Ghats to their summits, and clothing the valleys that extend between their ridges. It abounds with the teak and various other lofty forest trees, festooned by enormous perennial creepers. The bamboo forms a thick and luxuriant underwood in some places, while others are entirely open, and the banks of many clear and rapid streams flowing through it, abound with the black pepper plant, the wild cinnamon and other odoriferous shrubs. Portions of this forest are often left entirely untouched by the axe or knife, forming a thick impervious shade for the growth of the black pepper, cardamom, and Mari palm (*Caryota urens*). These are called ‘kans’ and are favourite resorts of wild animals.”

“To the east of the regular forest lies a tract called the Mulnad, or rain-country (though the native of the plains often includes the ‘jhari,’ or forest, under the same denomination), in which the trees degenerate into large bushes, the bamboo almost entirely ceases, and cultivation, chiefly of rice, becomes much more frequent. The bushes consists of the karunda, the pallas, etc. It abounds in tanks and artificial reservoirs for purposes of irrigation.”

“East of the Mulnad is a great extent of alluvial plain producing fine crops of wheat, cotton, maizes, millet, etc. (*Holcus sorghum*, *Panicum italicum*, *Cicer arietinum*), and on the Nizam’s frontier are found a succession of low dry hills, with tabular summits often rising in abrupt scarped precipices, and intersecting and traversing the plains in various directions. They are clothed with low thorny jungle of babul and acacia, and their bases, and the valleys between, composed of a light sandy soil, are cultivated with millet, vetches, etc. (*Panicum spicatum*, *Panicum miliare*, *Phaseolus max*, *Phaseolus mungo*, &c.).”

“The first or mountainous division consists chiefly of micaceous clay, and other schists, which to the northward are succeeded by

basaltic or trap formation. The Mulnad is composed of undulating clay-slate hills, which become covered with basalt to the north. This trap formation extends in a slanting direction from south-west to north-east nearly coinciding with a line drawn from Sadasheaghur on the coast, to Beejapoor and Sholapoor—and, what is remarkable, is almost coincident with that marking the separation of the two great tribes of the population using totally distinct languages—the Mahrattas and Canarese.

“The hills to the north-east and east are all of primitive sandstone, sometimes resting on schists, sometimes immediately on the granite, which latter is the rock nearest the surface in the central and eastern plains. But a well defined range of hills to the south-west, called the Kupputgud, is entirely composed of micaceous and clay-slates, resting on granite. The hills more to the north and north-west are basaltic. The extensive plains lying between these different lines of hills and eminences are composed of the rich, black mould, called regur, or cotton ground, resulting from decomposed basaltic rocks. To the north-east a considerable tract of limestone is found, resting on the sandstone, about Bagalkote. Badami Hungund, Mudibihisal, etc. . . .”

Mr. Shortridge has furnished the following short notes on the actual localities in which he collected:—

“Dharwar—Chiefly red Mulnad country, except to the north, where there are large areas of black cotton soil. Flat or undulating with a few bare rocky hills to the east. Those on the west being more or less covered with scrub which gradually changes into forest as the Kanara border is approached. Large areas under cultivation. Altitude 2,500 feet.”

“The prolific results of the collections throughout the district are largely due to the active and invaluable assistance received from Mr. R. M. Phillips, D.S.P., whose guest I was during the whole of my two months’ stay in Dharwar, while many thanks are also due to Mr. E. Macconochie, I.C.S., the Collector of the District, for his kindness and help, particularly in instructing and causing the native officials in all of the places I visited to give me a great deal of assistance.”

“Alnavar and Avatgi—About 24 miles west of Dharwar, on the borders of North Kanara. Red soil and where there is no cultivation thick Mulnad scrub or partly open country covered with long grass. A number of hills, largely covered with teak and other forest trees. Altitude about the same as Dharwar.

“Short camps only were made at these places.”

“Devikop—26 miles south of Dharwar. On the borders of the Kanara forest which starts abruptly on it, south and west of the village. Flat or slightly undulating with chiefly open and cultivated country to the north and north-east. Altitude 2,000 feet.”

“Gadag and Lakundi—Although Gadag itself is situated on a patch of red soil the district proved a perfect centre for working the black cotton country which extended in flat and almost treeless areas in every direction, only broken in the south by a few distinct ranges of rocky hills. Cotton is grown over the whole country while the few scattered trees are mostly babul which fringe the roads forming not very shady avenues. The chief cover for any of the larger animals being stray patches and hedges of prickly pear.

“I stayed here for nearly a fortnight with Mr. T. J. Spooner, a keen and enthusiastic life member of the Society, and owing to his help and knowledge of the country I was able to get a very representative collection from the black cotton district.”

Hawsbhavi—About 15 miles to the west of Bayadi Station in the Southern Dharwar District, open, undulating red sandy country in all directions, with scattered babul trees and toddy palms, patches of black cotton country to the north and some low ranges of rocky hills to the east.

“Large areas under cultivation, many of the villages surrounded by mango trees, cocoanut and areca palms.

“I camped here for ten days, afterwards moving on to Tillevelly, a neighbouring village.”

“Honkan—A small village situated on the banks of the

Varadi river, a permanently running clear stream that eventually joins the Tungabhadra.

“At this point the river forms the boundary between the Dharwar District and north-western Mysore.

“The country is quite flat and covered with very dense scrub jungle, largely composed of low deciduous trees, thick masses of Karunda and other bushes which are curiously even in height.

“The country to the east and the Mysore territory on the south bank of the river are more open, leading eventually to black cotton plains. One of the most curious things noticed here was the frequent occurrence of the black buck well within the thickest parts of the jungle which afford cover for its much more natural inhabitants, chital, pig and four-horned antelope, while on one occasion during a beat I witnessed the unusual sight of a number of chital and black buck simultaneously crossing a road running through the centre of a particularly large and thick piece of jungle.”

“Samasgi—About twelve miles to the north of Honkan situated at the point where the three territories of Southern Dharwar, Mysore and Kanara meet.—. Samasgi which is a small native village is situated in high deciduous forest which surrounds it on all sides.

“There are isolated patches of cultivation and many dense lantana thickets. Undulating, almost hilly country, the forest being similar to those around Devikop.”

The collection contains in all 749 specimens, belonging to 51 species, in 40 genera. In view of the whole-hearted way in which the Mammals of this District were worked over 70 years ago, by Sir W. Elliot, it is not surprising to find that there is nothing “new” in the present collection. This does not, however, detract from its great value, for it furnishes us with topotypes of no less than 8 species, named by Gray, &c., on specimens obtained by Elliot. These are as follows: (1) *Hipposideros fulvus*, Gray (= *murinus*, Gray = *fulgens*, Elliot = *murinus*, Elliot). (2) *Pachyura nigra*, Horsfield. (3) *Mus manei*, Gray (nom. nud.). (4) *Leggaad*

booduga, Gray (= *Mus lepidus*, Elliot). (5) *Epimys rufescens*, var.= *Mus rufus*, Elliot= *Mus flavescens*, Elliot (both names pre-occupied). (6) *Millardia meltada*, Gray (= *Mus mutade*, Elliot= *Mus lanuginosus*, Elliot). (7) *Gunomys kok*, Gray (= *Mus* (*Neotoma*) *providens*, Elliot). (8) *Golunda ellioti*, Gray (= *Mus golundi*, Elliot= *Mus hirsutus*, Elliot).

Out of the list of 58 species (really 56 for *H. fulvus* and *Epimys rattus* are entered under two names) recorded by Sir W. Elliot, Mr. Shortridge has obtained 51; those not obtained are mostly large animals from the heavy forest country now forming the Kanara District. As Mr. Shortridge notes "four species mentioned by Sir W. Elliot, viz., *Boselaphus tragocamelus*, *Cynelurus jubatus*, *Canis pallipes* and *Hyæna hyæna* are now either entirely absent in the Dharwar District or rare stragglers south of Haidarabad."

Mr. Shortridge has taken a single specimen of the Common five-striped Squirrel (*Funambulus pennanti*) at Dharwar. This is somewhat of a surprise to me. I have taken it with the Palm Squirrel in Surat District, while Mr. Crump has sent them both from Nimar and Berar, and both occur in Bombay Island, so that we must, on the data available, accept 22° Lat. as about the northern boundary of *palmarum*. *F. pennanti* has been obtained by Capt. Whitehead at Sehore, by Mr. Caccia, I.F.S., at Hoshangabad and by the Society from Nasik, so that, until the present specimen turned up, the most southern record was about 20° N. Lat., and this is what one would expect, allowing for a slight overlap in the distribution of the two species. Perhaps some members who are favourably placed will push this enquiry further and report their results in the Journal. *F. palmarum* is at once recognisable by the bright red-yellow colouring of the under side of the tail and the presence of only three pale stripes on the back. In *F. pennanti* there are five pale stripes, though the outer one, on each side, is sometimes not very bright, and there is never any trace of colour on the under side of the tail.

In his List Sir W. Elliot includes *Mus decumanus*, unfortunately without any indication of its characters, so that it is impossible to say to what animal he was referring; that it was really the

European Brown Rat seems to me an absolute impossibility. From the vernacular name given by Elliot his *decumanus* was a house rat.

SIMIA SINICA, L.

The Bonnet Monkey.

1771. *Simia sinica*, Linnæus. Mantissa, p. 521.
 1812. *Cercocebus radiatus*, Geoffroy. Ann. du Mus. XIX, p. 98.
 1888. *Macacus sinicus*, Blanford. Mammalia, No. 10.
 ♂ 107, 109; ♀ 108, 110. Dharwar.
 ♂ 142; ♀ 143. Devikop, Dharwar.
 ♂ 749, 750; ♀ 751, 752, 753, 754. Samasgi, S. Dharwar.

Vernacular names.—Kóti, Kapi, Mangá, Maungyá, Kempmangá (Kanarese); Mákad Lál mangá (Marathi); Mángya-Kóti (Haran Shikaris and Waddars); Bandra (Dekhani).

["Very plentiful; often going about in large parties of from 20 to 30. Although said to avoid each other, I once saw troupes of these Monkeys and Langurs on the banks of a stream, apparently mixing together on quite friendly terms, but, when frightened, they went off separately.

"At Gadag, in the vicinity of Hindu Temples, where they are protected, they are said to have died, in large numbers, from Bubonic Plague."—G. C. S.]

PRESBYTIS HYPOLEUCOS, Blyth.

The Malabar Langur.

1841. *Semnopithecus hypoleucos*, Blyth. J.A.S.B., p. 839.
 1842. *Semnopithecus dussumieri*, Is. Geoffroy. Comptes Reudus. XV, p. 719.
 1888. *Semnopithecus hypoleucus*, Blanford. Mammalia, No. 15.
 ♂ 52; ♀ 47. Alnavar, Dharwar.
 ♂ 145, 146, 147, 183, 185; ♀ 148, 186. Devikop, Dharwar.
 ♂ 714, 717 juv.; ♀ 715, 716 juv. Hawsbhavi, S. Dharwar.
 ♂ 747, 748, 781, 791, 792; ♀ 744, 745, 746, 793. Samasgi, S. Dharwar.

This species was named by Blyth from the Malabar Coast; the present series seems to fit his description.

Vernacular names.—Mushya, Kari-Kóti, Adavi-Koti (Kanarese); Yerpa-Moti-Koti, Karimikkamungyá (Waddars) Kari-Mangyá (Haran Shikaris) Wángá, Wánar, Maka (Marathi); Langúr (Dekhani).

["Extremely plentiful; generally fearless and inquisitive, easily distinguishing between Europeans and Natives, and much more suspicious in the presence of the former. When frightened they can crouch among the tops of thick trees, and by grasping and drawing branches together, become completely hidden."—G. C. S.]

PTEROPUS GIGANTEUS, Brünn.

The common Flying-Fox.

(Synonymy in No. 2.)

♂ 53, 55, 56, 57, 59, 60, 73; ♀ 54, 58, 72. Avatgi, Dharwar.

♀ 125, 126, 127, 128, 129, 130. Devikop, Dharwar.

♂ 707, 711, 719, 720; ♀ 577, 579, 580, 712 (in al.), 713.
Hawsbhavi, S. Dharwar.

♂ 731. Honkan, S. Dharwar.

(See also Reports Nos. 2, 3 and 4.)

Vernacular names.—Togal-Bávali, Kichapála, Bávali (Kanarese); Wad-wágal (Marathi); Toggal-Bávali-Gua, Sikattélla (Waddars), Gaddal, Gífta (Haran Shikaris).

["Very plentiful, around Dharwar, at this time of the year; they feed chiefly on tamarinds and wild figs.

"Appearing to avoid thick forests."—G. C. S.]

LYRODERMA LYRA, Geoffr.

The Indian Vampire Bat.

(Synonymy in No. 1.)

♂ 131, 133, 188, 194, 195; ♀ 132, 156, 160, 187, 189, 196, 197,
198, 199, 200, 201, 202, 203. Devikop, Dharwar.

♀ 732 (in al), 735. Honkan, S. Dharwar.

♀ 803. Hangal, S. Dharwar.

(See also Reports Nos. 1 and 2.)

These specimens, like those from E. Khandesh, come from the geographical boundary (about 76° E. Long.) between true *lyra* and the subspecies *caurina* which differs mainly in size. A very large proportion of the present series is undoubtedly true *lyra*, but, as was to be expected, there are some "wrong 'uns." One specimen has the dimensions of *caurina* and two are intermediate between it and true *lyra*.

["This bat, which is plentiful in both forest and Mulnad country, is a late flyer.

"I have found it by day in wells and old temples and once in a hollow tree."—G. C. S.]

MEGADERMA SPASMA TRIFOLIUM, Geoff.

*The Malay Vampire Bat.*1810. *Megaderma trifolium*, Geoffroy. Ann. Mus. d'H.N. XV, p. 193.1863. *Megaderma horsfieldi*, Blyth. Cat. Mamm., p. 23.1891. *Megaderma spasma*, Blanford. Mammalia, No. 170.

♂ 739, 741; ♂ 738, 740 (in al.) juv., 742. Honkan, S. Dharwar

The true *spasma* is an inhabitant of the Moluccas and Philippines; the present form was first described from a specimen from Java.

RHINOLOPHUS ROUXI, Temm.

*The Rufous Horseshoe-Bat.*1835. *Rhinolophus rouxi*, Temminck. Mon. Mamm. II., p. 30 b.1852. *Rhinolophus rubidus*, Kelaart. Prodr. Faun. Zeyl., p. 13.1852. *Rhinolophus cinerascens*, Kelaart. 1. c.1852. *Rhinolophus rammanika*, Kelaart. 1. c., p. 14.1872. *Rhinolophus petersi*, Dobson. J. A. S. B. XLI (2), p. 337.1891. *Rhinolophus affinis*, Blanford. Mammalia, No. 150.♂ 135, 137, 139, 174, 177; ♀ 134, 136, 138, 140, 141, 178,
179, 180, 181. Devikop, Dharwar.

Blanford ranks *rouxi* as a synonym of *affinis*, but Dr. K. Andersen has pointed out (P. Z. S. 1905, p. 75 *et seq.*) that the form of the nose-leaf in the two is entirely different. In the same paper Dr. Andersen has gone fully into the name *petersi* and shown it to be a synonym of *rouxi*, and further has shown that Kelaart's three names represent the "colour phases" of one species and that one identical with *rouxi*.

Vernacular names (for all small bats.)—Kanakappadi, Kanakappate, Kankappate (Kanarese); Wágál (Marathi); Koptel, Sancipta (Waddars and Haran Shikaris).

["Plentiful at Devikop; a late flyer, roosting by day in hollow trees, wells and in old temples."—G. C. S.]

HIPPOSIDEROS DUKHUNENSIS, Sykes.

*Sykes' leaf-nosed Bat.*1831. *Rhinolophus dukhunensis*, Sykes. P. Z. S., p. 99.1838. *Hipposideros apiculatus*, Gray. Mag. Zool. Bot. II, p. 492.1838. *Hipposideros penicillatus*, Gray. 1. c.1852. *Hipposideros templetonii*, Kelaart. Prod., p. 17.1852. *Hipposideros aureus*, Kelaart. Prod., p. 18.1852. *Hipposideros blythii*, Kelaart. Prod., p. 20.1891. *Hipposiderus speoris*, Blanford. Mammalia, No. 164.

♂ 320, 321, 323, 324, 325, 326, 327, 328, 333, 358, 359;

♀ 317, 318, 319, 322, 329, 330, 331, 332, 334, 335, 336,
360, 361 (in al.), 343, 344, 345, 346, 347, 348, 349, 350.

Gadag, Dharwar.

The name *speoris* was given by Schneider to a bat from Timor. I have seen no specimen from that locality, but both Sykes and Gray agree that the Indian form is separable. The names available are *dukhunensis*, Sykes, and *apiculatus* and *penicillatus*, Gray. These specimens are quite like the type of *apiculatus* of which they are topotypes. Though I have not seen an undoubted specimen of *dukhunensis*, its type locality is so close to Dharwar that, pending refutation, *dukhunensis* must be accepted as the proper name of the species.

HIPPOSIDEROS FULVUS, Gray.

The bicoloured leaf-nosed Bat.

(Synonymy in No. 3.)

♀ 245. Dharwar.

♂ 446; ♀ 403, 447, 448, 449, 451, 452, 453, 454, 455, 456.

Gadag, Dharwar.

These are topotypes of Elliot's *murinus* and *fulgens*, the latter being merely the red phase of the former, and equally so of Gray's *fulvus* and *murinus*.

(See also Report No. 3.)

PIPISTRELLUS CEYLONICUS, Kel.

Kelaart's Pipistrelle.

(Synonymy in No. 1.)

♂ 42, 44, 46, 77, 86, 87, 98, 386, 387, 389, 390, 392, 395, 398, 411; ♀ 41, 43, 45, 67, 83, 84, 85, 96, 97, 99, 246, 384, 385, 391, 393, 394, 396, 397, 399, 412. Dharwar.

(See also Reports Nos. 1, 2 and 3.)

["Very plentiful in a Hindu Temple at Gadag, hiding in crevices."—G.C.S.]

PIPISTRELLUS COROMANDRA, Gray.

*The Coromandel Pipistrelle.*1838. *Scotophilus coromandra*, Gray. Mag. Zool. Bot. II, p. 498.1851. *Vespertilio coromandelicus*, Blyth. J. A. S. B. XX, p. 159.1853. *Myotis parvipes*, Blyth. J. A. S. B. XXII, p. 581.1872. *Vesperugo micropus*, Hutton. P. Z. S., p. 707.1891. *Vesperugo abramus*, Blanford. Mammalia No. 187.

♂ 703. Hawsbhavi, S. Dharwar.

♂ 775, 783; ♀ 773, 807, 808. Samasgi, S. Dharwar.

Temminck's names *imbricatus* and *abramus* refer to species found in Java and Japan respectively. Gray based his *coromandra* on the "*Vespertilio* de Coromandel" described by F. Cuvier from a specimen taken at Pondichery. The names *parvipes* and *micropus* were both based on a *Pipistrelle* taken by Hutton at Masuri, it is quite possible it may prove to be distinct from the present form.

PIPISTRELLUS DORMERI, Dobs.

Dormer's Pipistrelle.

(Synonymy in No. 1.)

♂ 588. Hawsbhavi, S. Dharwar.

(See also Reports Nos. 1, 2 and 3.)

PIPISTRELLUS MIMUS, Wrought.

The Southern dwarf Pipistrelle.

(Synonymy in No. 1.)

♂ 218, 571 (in al.). Dharwar.

♀ 316 (in al.). Gadag, Dharwar.

♂ 589, 590, 591; ♀ 592, 721. Hawsbhavi, S. Dharwar.

(See also Reports Nos. 1, 2 and 3.)

HESPEROPTENUS TICKELLI, Blyth.

Tickell's Bat.

1857. *Nycticejus tickelli*, Blyth. J. A. S. B. XX, p. 157.

1857. *Nycticejus isabellinus*, Horsfield. Cat. Mamm., p. 38.

1891. *Vesperugo tickelli*, Blanford. Mammalia No. 191.

♂ 811, 812; ♀ 776, 798, 799, 805, 810. Samasgi, S. Dharwar.

Horsfield in his Catalogue gave the name *isabellinus* on the authority of a manuscript name of Blyth's, fortunately Blyth had already published the name *tickelli* before the Catalogue appeared. The two names therefore refer to the same animal whose type locality is Chaibasa "in Central India" (or more correctly Cuttack).

SCOTOPHILUS KUHLI, Leach.

The common yellow Bat.

(Synonymy in No. 1.)

♂ 17, 458; ♀ 34, 82. Dharwar.

♀ 772, 806. Samasgi, S. Dharwar.

(See also Reports 1 and 3.)

["Plentiful; an early flyer, coming out at the same time as *Pipistrellus*."—G. C. S.]

SCOTOPHILUS WROUGHTONI, Thos.

Wroughton's Bat.

(Synonymy in No. 1.)

♂ 217; ♀ 404. Dharwar.

(See also Report No. 1.)

TYLONYCTERIS PACHYPUS, Temm.

The club-footed Bat.

1840. *Vespertilio pachypus*, Temminck. Mon. Mamm. II, p. 217.

1859. *Scotophilus fulvidus*, Blyth. J. A. S. B. XXVIII, p. 293.

1891. *Vesperugo pachypus*, Blanford. Mammalia No. 180.

♀ 743. Honkan, S. Dharwar.

♀ 782. Samasgi, S. Dharwar.

The type locality of *pachypus* is Java, while *fulvidus* was established by Blyth on a specimen from Tenasserim.



THE PAINTED BAT, *KERIVOULA PICTA*, PALLAS.

KERIVOULA PICTA, Pall.

The pointed Bat.

1767. *Vespertilio pictus*, Pallas. Spicil. Zool. III, p. 7.

1891. *Cerivoula picta*, Blanford. Mammalia No. 213.

♂ 11; ♀ 28. Dharwar.

The type came from Ternate in the Molucca Archipelago: the present specimens differ somewhat from the type, which is in the National Collection, but the material is not sufficient on which to base a strict diagnosis.

["Said to hide by day among thick foliage, clinging to the under side of leaves, where their bright colours would have a protective resemblance to dead leaves.

"Apparently very widely distributed, although somewhat rare everywhere.

"The brilliant orange of the wing membranes fades almost immediately after death. This colour seems to vary in shade in individuals from Java."—G.C.S.]

RHINOPOMA HARDWICKII, Gray.

The lesser Indian mouse-tailed Bat.

(Synonymy in No. 3.)

♂ 386, 369, 370, 373, 428; ♀ 357, 371, 372, 427. Gadag Dharwar.

(See also Report No. 3.)

["Fairly plentiful in old Hindu Temples at Gadag and Lakundi, sometimes found in company with *Hipposideros dukhunensis* although not in such large numbers. All were enormously fat, especially this species, in which it is manifested in the form of swellings at the root of the tail present in both sexes, but more particularly in the males. At certain times of the year these swellings are developed to such an extent as to interfere with the flight of the bats."—G.C.S.]

NYCTINOMUS TRAGATUS, Dobs.

Dobson's wrinkle-lipped Bat.

(Synonymy in No. 3.)

♀ 383. Gadag, Dharwar.

(See also Report No. 3.)

PACHYURA.

Shrews.

♂ 7, 19, 251, 286; ♀ 212, 287. Dharwar.

♂ 418, 442. Gadag, Dharwar.

- ♂ 573; ♀ 574, 575, 598. Hawsbhavi, S. Dharwar.
 ♂ 727, 733; ♀ 734. Honkan, S. Dharwar.

(See also Reports 1, 3 and 4.)

Vernacular names.—Múgili, Sundili, Sondili, Chichikili (Kanarese); Chichandári (Marathi); Sónði, Sondiyelka (Waddars and Haran Shikaris).

[“Fairly plentiful around stables and outhouses, widely distributed, though apparently not in great numbers.”—G.C.S.]

PACHYURA NIGRA, Horsf.

The Nilgiri Wood Shrew.

1851. *Sorex niger*, Horsfield. Cat. E. I. C. Mus., p. 135.
 1888. *Crocidura murina*, Blanford. Mammalia No. 117 (partim).
 ♀ 220. Dharwar.

This is a topotype of Elliot's *Sorex niger* which was never published. Horsfield quoted it from Elliot's Manuscript and gave a short description; the name stands therefore on Horsfield's responsibility. Whether the name will stand for the species ultimately must be left for decision when more material is available, but for the present we are on firm ground in adopting for it the name *nigra*.

FELIS PARDUS, L.

The Panther.

1766. *Felis pardus*, Linnæus. Syst. Nat., p. 61.
 1775. *Felis leopardus*, Wagner. Schreb. Saug. III, pl. ci.
 1888. *Felis pardus*, Blanford. Mammalia, No. 30.
 ♂ 726. Hawsbhavi, S. Dharwar.
 ♀ 801. Samasgi, S. Dharwar.

Vernacular names.—Kiraba, Hongiya, Chirate, Chirchu, Sannhuli (Kanarese); Chíta-Wagh, Chíta-Bágh, Bíbta, Hasánya (Marathi); Kírrbah, Kurrkuda (Haran Shikaris); Chóta-Bágh, Théndwa (Dekhani).

FELIS AFFINIS, Gray.

The Jungle Cat.

(Synonymy in No. 1.)

- ♂ 78, 240, 469; ♀ 22, 224, 470, 471, 474. Dharwar.
 (See also Reports Nos. 1, 3 and 4.)

Vernacular names.—Kádubekku, Mántbekku, Adávibekku (Kanarese); Júngli Mániar (Marathi); Burakátchki (Haran Shikaris); Júngli-billi (Dekhani).

[“Very plentiful; hunts a lot by day. Its long legs give it a very distinctive appearance, in the open its movements are very much like those of a small panther. Very swift and exceedingly strong for its size; it is probably capable of bringing down quite large game. Kittens become

tame quickly, although never to the same extent as those of a domestic cat. They become perfectly fearless, although remaining amusingly savage, especially at feeding time."—G. C. S.]



Kittens of the Jungle Cat.

FELIS RUBIGINOSA, Geoffr.

The rusty-spotted Cat.

1834. *Felis rubiginosa*, Is. Geoffroy. Belanger Voy. Ind. Or., p. 141.

1888. *Felis rubiginosa*, Blanford. Mammalia No. 37.

♂ 21. Dharwar.

Vernacular names.—Kiraba-Bekku (Kanarese); Ark-Philli (Waddars).

[“Apparently rare round Dharwar.”—G. C. S.]

VIVERRICULA MALACCENSIS, Gmel.

The small Indian Civet.

(Synonymy in No. 3.)

♂ 79, 100, 285, 291, 472, 473; ♀ 8, 226, 241. Dharwar.

♂ 182. Devikop, Dharwar.

(See also Report 3.)

Vernacular names.—Punagina-Bekku (Kanarese); Jowádi-Mánjur (Marathi); Puluk-Philli (Waddars); Punkassibekk (Haran Shikaris); Múshak-billi (Dekhani).

[“Plentiful; the large number of small carnivora around Dharwar may account for the comparative scarcity of hares and game birds, although their chief food probably consists of *Tatera* and the other field-rats, which exist in such enormous numbers.”—G. C. S.]

MUNGOS MUNGO, Gmel.

The common Indian Mongoose.

(Synonymy in No. 1.)

♂ 9, 71, 476; ♀ 101, 102, 225, 475, 477, 482, Dharwar.

♂ 648; ♀ 677. Hawsbhavi, S. Dharwar.

(See also Reports 1, 2, 3 and 4.)

Vernacular names.—Múngali, Mungili (Kanarese); Mungús (Marathi and Dekhani); Múngsi, Antúr (Waddars and Haran Shikaris).

[“Plentiful; their burrows are frequently found in prickly pear thickets, numerous broken off spines of that plant being often found imbedded in their bodies. Although seldom leaving the ground, this species is a good and agile tree climber.”—G. C. S.]

PARADOXURUS NIGER, Desm.

The Indian Toddy Cat.

1820. *Viverra nigra*, Desmarest. Mamm., p. 208.

1820. *Viverra bondar*, de Blainville. Mamm., p. 210.

1821. *Paradoxurus typus*, F. Cuvier. Hist. Nat. Mamm., pl. 186.

1832. *Paradoxurus pennanti*, Gray. P. Z. S. p., 65.

1835. *Platyschista pallasii*, Otto. Ac. C. d. Nov. Act. XVII, p. 1089.

1891. *Paradoxurus nictitans*, Taylor. Jour. B. N. H. S., Vol. VI, p. 429.

1888. *Paradoxurus niger*, Blanford. Mammalia, No. 51.

♂ 50; ♀ 49, 51. Alnavar, Dharwar.

♀ 184, 242, 243, 247, 292. Dharwar.

♂ 708. Hawsbhavi, S. Dharwar.

♀ 768, 769. Samasgi, S. Dharwar.

This is a most puzzling species to deal with; it seems to have several colour forms but they are not also local forms, any or all of them may be found in any locality, including Zanzibar, Madagascar (?), Mauritius, &c., where they have been introduced. The only safe course is to call them all *niger*.

Vernacular names.—Kerabekku (Kanarese); Menuri (Marathi and Dekhani); Nulla-phílli (Waddars); Mahngutchi (Haran Shikaris).

[“Plentiful, especially near houses, in the roofs of which they often live, and may be heard at night chasing rats. When caught young this animal becomes tame in a very short time.”—G. C. S.]

CANIS INDICUS, Hodgs.

The Jackal.

(Synonymy in No. 1 under *C. aureus*.)

♂ 481; ♀ 284, 294, 484. Dharwar.

♂ 718 juv.; ♀ 608 juv. Hawsbhavi, S. Dharwar.

(See also Reports 1, 3 and 4.)

Vernacular names.—Nari (Kanarese); Kóla (Marathi and Dekhani); Náikka, Tada Náikka (Waddars).

[“Very plentiful both in open and forest country.”—G. C. S.]

VULPES BENGALENSIS, Shaw.

The common Indian Fox.

(Synonymy in No. 1.)

♂ 493; ♀ 68, 486. Dharwar.

♂ 122. Devikop, Dharwar.

♂ 311. Gadag, Dharwar.

♂ 609. Hawsbhavi, S. Dharwar.

(See also Reports Nos. 1 and 3.)

Vernacular names.—Kunní-Nari, Kemp-Nari, Kónk, Chándak-Nari (Kanarese); Lókri kókri (Marathi); Gúnta-Nakka (Waddars).

[“Fairly plentiful, chiefly among rocky hills and broken country, often seen in the day-time. This fox is said to be difficult to hunt, except by sight, as it leaves a very slight scent.”—G. C. S.]



The common Indian Fox from a photograph.

RATUFA INDICA, Erxl.

*The Bombay Giant Squirrel.*1777. *Sciurus indicus*, Erxleben. Syst. Reg. An., p. 420.1777. *Sciurus purpureus*, Ximmermann. Spec. Zool. Grog. Anad., p. 518.1785. *Sciurus bombayannus*, Boddaert. Elench. An., p. 117.1831. *Sciurus elphinstonei*, Sykes. P. Z. S., p. 103.1891. *Sciurus indicus*, Blandford. Mammalia, No. 239 (partim).

♂ 150, 151, 158, 161, 164, 165, 166, 192; ♀ 149, 157, 163,
191. Devikop, Dharwar.

♂ 784, 786, 788, 789; ♀ 758, 759, 770, 778, 779, 780, 785, 787
Samasgi, S. Dharwar.

Blandford wrote on these squirrels in a paper in our Journal (Vol. XVI, p. 298) and later I dealt with them (Vol. XIX., p. 880.) These specimens are unmistakably *indicus*, which is curious for Mysore specimens, I believe, belong to another of Blandford's races.

Vernacular names.—Kadalale, Kempalale (Kanarese); Tambrikár (Marathi); Bet-urtá (Waddars and Haran Shikaris); Kargilherí, Jungli Gilheri (Dekhani).

["Plentiful in the Forests round Devikop and Samasgi. Very active and rather shy. Where abundant, it soon makes its presence known by its loud call; any sudden noise, such as hitting a tree sharply with a stick, will often start these squirrels calling in all directions."—G. C. S.]

FUNAMBULUS PALMARUM, L.

The Palm Squirrel.

(Synonymy in No. 2.)

♂ 95, 103, 105; ♀ 6, 104, 106, 214, 250. Dharwar.

♂ 337, 338, 421; ♀ 420. Gadag, Dharwar.

♂ 646, 653, 654, 655; ♀ 611, 616, 661, 662, 687. Hawsbhavi S. Dharwar.

(See also Reports 2 and 4.)

Vernacular names.—Alale, Alalu, Inachi, Vúrchí (Kanarese); Káráni (Marathi); Úrta (Waddars and Haran Shikaris); Gilehri (Dekhani).

["Very plentiful, occurring everywhere except in the forest country where it is replaced by *F. tristriatus*. Particularly abundant in the neighbourhood of houses—sleeping in the roofs and spending the day in the verandahs and surrounding trees. Its call, which is a loud unmusical chatter, is uttered very frequently; when startled, angry, or in any way excited.

"They may often be found in prickly pear thickets, when their mouths are usually stained crimson with the juice of the fruit. Both this species and *tristriatus* feed also on the berries of the *Lantano*."—G. C. S.]

FUNAMBULUS TRISTRIATUS, Waterh.

The jungle Striped Squirrel.

1837. *Sciurus tristriatus*, Waterhouse. Charl. Mag. N. H. I, p. 499.

1667. *Sciurus (Tamias) dussumieri*, Milne-Edwards. Rev. Mag. Zool. XIX, p. 226.

1891. *Sciurus tristriatus*, Blanford. Mammalia, No. 254.

♀ 1, 2, 35. Dharwar.

♂ 206; ♀ 124, 176, 205. Devikop, Dharwar.

♂ 774, 777, 814, Skulls only, 794, 795, 796. Samasgi, S. Dharwar.

"Replaces *F. palmarum* in the forest part of the Mulnad. Its call however is distinct, being softer and much more musical."—G. C. S.]

FUNAMBULUS PENNANTI, Wrought.

The common five-striped Squirrel.

(Synonymy in No. 1.)

♂ 69. Dharwar.

I was much astonished to find this animal in the collection. I was not aware that it came south of Bombay.

(See also Reports Nos. 1, 2, 3 and 4).

TATERA INDICA, Hardw.

The Indian Gerbil.

(Synonymy in No. 1.)

♂ 3, 61, 62, 118, 119, 215, 216, 221, 222, 228, 267, 268, 274, 277, 279, 280, 283, 288, 289, 290 ; ♀ 4, 5, 70, 88, 89, 116, 117, 232, 249, 269, 270, 273, 275, 276, 278, 281, 282, 293, 485. Dharwar.

♀ 152, 153, 154, 155, 159. Devikop, Dharwar.

♂ 307, 308, 340 ; ♀ 309, 310, 426. Gadag, Dharwar.

♂ 583, 585, 586, 600, 602, 606, 607 ; ♀ 582, 584, 587, 599, 601, 603. Hawsbhavi, S. Dharwar.

(See also Reports Nos. 1, 2, and 4.)

Vernacular names.—Ili (all rats, mice) ; Bilaili, Kádili, Buddilchi (Kanarese) ; Úndir (Marathi) ; Yélka, Yerí-yélka, Ili Yélka (Waddars) ; Júngli-Choua (Dekhani).

[“Plentiful everywhere, but most plentiful in red soil country near cultivation, where their rather large burrows are very noticeable, nocturnal. Always numerous among prickly pear thickets and hedges, when they frequently have their mouths and feet stained crimson with the juice of the fruit. Their speed and agility are remarkable.”—G. C. S.]

VANDELEURIA OLERACEA, Benn.

The Dekhan Tree-Mouse.

(Synonymy in No. 2.)

♂ 27, 208, 209, 210, 211. Dharwar.

♀ 578. Hawsbhavi, S. Dharwar.

(See also Reports 2 and 4.)

Vernacular name.—Malkélka Meinélka (Waddars).

[“Apparently not very plentiful around Dharwar. Four young, that were kept alive, were very active, and great climbers. When resting in a bush their tails would generally be curled round a branch.”—G. C. S.]

MUS MANEI, Kel.

The common Indian House-Mouse.

1852. *Mus manei*, Kelaart. Prod., p. 64.

1891. *Mus musculus*, Blanford. Mammalia, No. 282 (partim).

♂ 231, 244 ; ♀ 15, 229, 230 (in al.), 252, 253, 254, 255, 256, 257, 258, 259. Dharwar.

♂ 296, 298, 299, 341 (in al.), 406, 407, 408, 409, 410, 434, 435, 436; ♀ 297, 302, 342 (in al.), 405. Gadag, Dharwar.

These are topotypes of Gray's *Mus manei*. Unfortunately Gray published no description. In 1852 Kelaart applied the name to a Ceylon Mouse, whose description, as given by him, agrees quite closely with these specimens, except that the size quoted is rather small. Until specimens from Ceylon are available to show that they are distinct, I propose to use the name *manei* for the House-Mouse at any rate of Southern India. Kelaart points out that its longer tail, darker colour, and white toes differentiate it from *Mus musculus*.

["Particularly plentiful round Gadag. In the Dharwar District generally this species is not so generally distributed as *Epimys rufescens*. It appears to be quite absent in many villages and is never found at any distance from human habitations."—G. C. S.]

LEGGADA PLATYTHRIX, Sykes.

The Dekhan Spiny-Mouse.

(Synonymy in No. 1.)

♂ 13, 467, 468; ♀ 14, 30, 36, 37, 38, 39, 266, 271. Dharwar.

♀ 429. Gadag, Dharwar.

♂ 572, 597, 612, 623, 625, 627, 628, 649, 673, 674, 682; ♀ 596, 613, 614, 615, 624, 626, 629, 630, 650, 651, 675, 683, 686.

Hawsbhavi, S. Dharwar.

♂ 728, 729. Honkan, S. Dharwar.

(See also Reports Nos. 1, 2 and 4.)

Vernacular names.—Léggádé (Waddars).

["Plentiful, often living among piles of loose stones or rocks. In open country it throws a collection of small stones round the entrance to its burrow, which recalls *Mus albocinereus* of the sandy districts of Western Australia, which constructs a small circular net work of sticks round its hole, to prevent sand from blowing in and choking it up. Elliot however notes that *Leggada platythrix* frequently closes the entrance to its burrow."—G. C. S.]

LEGGADA BOODUGA, Gray.

The Southern Field-Mouse.

(Synonymy in No. 1.)

♂ 12, 29, 31, 219, 227; ♀ 32, 33, (in al.), 264, 265. Dharwar.

♂ 315, 362, 376, 379, 419, 430, 432, 439, 440, 441, 443, 444, 445, 488, 497, 498; ♀ 377, 378, 400, 431, 433, 437, 438, 495, 496, 497, 499, 500, 501, 502, 503 (in al.), 489, 490. Gadag, Dharwar.

♂ 595, 632, 658, 660, 709; ♀ 581, 656, 657, 693 (in al.), 633 to 645, 663, 665, 666, 667. Hawsbhavi, S. Dharwar.

The Dharwar specimens are topotypes of Gray's *booduga*, which was based on specimens sent by Elliot.

(See also Reports Nos. 1, 2 and 4.)

Vernacular names.—Budúga (Kanarese); Chittagand, Chittayelka (Waddars).

[“Very plentiful everywhere, especially in cultivated country.”—G. C. S.]

EPIMYS RUFESCENS, Gray.

The common Indian Rat.

♂ 20, 26, 114, 213; ♀ 113, 115, 121, 272. Dharwar.

♂ 112; ♀ 168, 169, 170. Devikop, Dharwar.

♂ 303, 306, 367; ♀ 300, 301, 304. Gadag, Dharwar.

♂ 460; ♀ 461. Hubli, Dharwar.

♂ 698. Hawsbhavi, S. Dharwar.

♂ 755, 763; ♀ 756, 757, 764. Samasgi, S. Dharwar.

VARIETY with white underparts.

♂ 16, 25, 120, 234, 235, 236, 237, 238, 239; ♀ 24, 111, 233.

Dharwar.

♂ 459. Hubli, Dharwar.

♂ 576, 621, 622, 689, 691; ♀ 688, 690, 692, 723. Hawsbhavi, S. Dharwar.

♂ 765; ♀ 761, 762. Samasgi, Dharwar.

(See also Reports Nos. 1, 2, 3 and 4.)

Vernacular names.—Ili (all rats, Kanarese); Ūndír (all rats, Marathi); Intyelka (Waddars); Chouá (all rats, Dekhani).

Hitherto all the specimens dealt with in these Reports have been uniformly characterised by dark underparts, whereas in this collection the majority are white below.

There has been at one time or another much discussion as to the taxonomic value of the belly colour in this very variable species.

Capt. Lloyd, I.M.S. (Records Ind. Mus. Vol. III, Part 1, page 92, 1909) writes: “White-bellied rats form a pure race in Rangoon; they are common in Calcutta. Out of 69 villages in the Punjab it was found that only 3 contained them in small numbers.” And again: “It cannot be doubted that the commonest type of *Mus rattus* in India is the dark-bellied one, and that the white-bellied type occurs sporadically.” In the Malay Peninsula, Siam and the islands of the Malay Archipelago the dark-bellied type forms only an insignificant portion of the whole.

Two parallel forms occur in Egypt, and Mr. L. Bonhote has been carrying out breeding experiments with these. Some of his recent results

are recorded in P. Z. S., 1912, page 6: "With regard to the heredity of the two normal varieties, the white-bellied form (*M. r. tectorum*) was found to be apparently a simple Mendelian dominant to the dark-bellied form (*M. r. alexandrinus*), the dark-bellied ones always breeding true and the heterogeneous light-bellied ones giving a proportion of pure *alexandrinus*."

According to Mr. Bonhote's results there can be no "intermediates" (*i.e.*, in the outward appearance) between the dark-bellied and white-bellied forms. Amongst these Dharwar specimens in the large majority of white-bellied individuals the belly is pure white, marked off from dark back colour by a well defined line, but in one or two this sudden transition from dark to white is absent, and over more or less the whole of the under surface the bases of the hairs are grey.

Amongst the *Chiroptera* and especially amongst the *Rhinolophidæ* it is well known that colour "phases" constantly occur, and these perhaps are analogous to these forms of *rufescens*.

For the present I propose to list the white-bellied form merely as a "variety" of *rufescens*, as the course at once the safest and most convenient.

This white-bellied variety is undoubtedly the *rufus* and *flavescens* of Elliot, but both names are preoccupied; should a name be at any time required, *arbores*, Buchanan Hamilton, is available and most apposite. Kelaart calls the corresponding animal in Ceylon "The white-bellied tree Rat."

Nos. 689, 690, 691, 692 above are representatives of the "sport" with a white spot on the forehead for which Capt. Lloyd has inadvertently established the name *brahminicus*; all four are quite young and evidently belong to the same litter.

MILLARDIA MELTADA, Gray.

The soft-furred Field-Rat.

(Synonymy in No. 1.)

- ♂ 10, 18, 40; ♀ 462 (in al.), 463, 464, 465, 466. Dharwar.
 ♂ 314, 339, 375, 401, 415, 416, 422, 424, 479, 480, 504; ♀ 374,
 413, 414, 423, 425, 478, 487, 491, 492, 494 (in al.), 402.
 Gadag, Dharwar.

The Dharwar specimens are topotypes of Elliot's *M. lanuginosus* as well as of *Mus meltada*, Gray.

(See also Reports Nos. 1 and 3.)

Vernacular names.—Mettada, Mettad Illi (Kanarese); Mettanyélka, Mettad (Waddars).

["Confined, almost, if not entirely, to black soil country, where it is probably chiefly destructive to cotton crops. These rats, in favourable seasons, increase in such enormous numbers as to eat down the crops of an

entire district. While at Dharwar I never found the species so plentiful as *Tatera* or *Gunomys*, although there is no doubt that at times it becomes a plague."—G.C.S.]

GUNOMYS KOK, Gray.

The Southern Mole-Rat.

(Synonymy in No. 1.)

♂ 23, 66, 91, 260, 261; ♀ 63, 64, 65, 90, 92, 93, 262, 263.
Dharwar.

♂ 173, 175; ♀ 162, 171, 172. Devikop, Dharwar.

♂ 351, 354, 355, 364, 380, 381, 382, 450; ♀ 305, 352, 353, 356,
363, 365, 366, 417. Gadag, Dharwar.

♂ 605; ♀ 604, 620, 685. Hawsbhavi, S. Dharwar.

(See also Reports 1 and 4.)

Vernacular names.—Kóka, lllkóka (Kanarese); Urpunigoóká (Haran Shikaris).

[“Although not in quite such enormous numbers as *Tatera*, this species probably comes second here as a destroyer of crops. Occurs everywhere both in open cultivation, and the thickest forest; its existence being always indicated by the mole-hill like mounds which it throws up. They are extremely savage and when in confinement will jump at, and attempt to bite, anything that comes near them, at the same time giving a series of angry grunts.”—G. C. S.]

BANDICOTA MALABARICA, Shaw.

The Malabar Bandicoot.

1801. *Mus malabaricus*, Shaw. Gen. Zool., p. 54.

1839. *Mus (Neotoma) giganteus*, Elliot. Madr. Jour. Land. S., p. 209.

1891. *Nesooia bandicota*, Blanford. Mammalia No. 296 (partim).

♂ 144, 190, 193; ♀ 167, 204. Devikop, Dharwar.

♀ 223. Dharwar.

♀ 760, 771, 813. Samasgi, S. Dharwar.

These certainly represent Elliot's *Neotoma gigantea*, but they seem most like the Travancore form. Compare my paper on the Bandicoots in this Journal (Vol. XVIII, p. 747).

Vernacular names.—Heggana (Kanarese); Ghús, Ghoús (Marathi and Dekhani); Phersakóka (Waddars).

[“Chiefly frequenting stables and outhouses, where they are said to be very destructive in undermining floors. The habits of the Java Bandicoot were entirely different, it lived in rice fields and was fond of water.

This rat (as well as *Funambulus*, *Tatera* and even *Simia*) is said to be very liable to bubonic plague, and occasionally to be found dead in numbers from that cause.”—G. C. S.]

GOLUNDA ELLIOTI, Gray.

The Indian Bush Rat.

(Synonymy in No. 1.)

♂ 248. Dharwar.

♂ 593, 617, 619, 659, 664, 669, 671, 676, 680, 694, 700, 701, 702, 710 ; ♀ 594, 610, 618, 631, 652, 668, 669, 670, 672, 678, 679, 681, 684, 695, 696, 697, 699, 704, 705 (in al.).
Hawsbhavi, S. Dharwar.

♂ 766 ; ♀ 767. Samasgi, S. Dharwar.

(See also Report No. 1.)

Vernacular names.—Gulanda (Kanarese); Serrumgúnda Gulandélka (Waddars).

These are topotypes of Gray's species, later ; in his Dharwar List, Elliot named it *hirsutus*.

HYSTRIX LEUCURA, Sykes.

The Indian Porcupine.

(Synonymy in No. 1.)

76 (skull only). Dharwar.

(See also Report No. 1.)

Vernacular names.—Mulluhani, Yédu (Kanarese); Sáial, Sáylar (Marathi and Dekhani); Yetundi, Yédu (Waddars and Haran Shikaris).

["Not plentiful round Dharwar."—G. C. S.]

LEPUS NIGRICOLLIS, Cuv.

The black-naped Hare.

1807. *Lepus hurgosa*, Buchanan. Voy. Mysore i., p. 169 (nomen nudum).

1823. *Lepus nigricollis*, F. Cuvier. Dict. Sc. Nat. XXVI, p. 307.

1843. *Lepus kurgosa*, Gray. Cat. Mamm. (nomen nudum).

1891. *Lepus nigricollis*, Blanford. Mammalia No. 319.

♀ 48. Alnawar, Dharwar.

♂ 75, 81 (imm.); 94. ; ♀ 74, 80. Dharwar.

♂ 123; ♀ 207. Devikop, Dharwar.

♂ 312, 313, 388; ♀ 457. Gadag, Dharwar.

♀ 647. Hawsbhavi, S. Dharwar.

♀ 730. Honkan, S. Dharwar.

♀ 790, 804 (in all.) Samasgi, S. Dharwar.

The type locality of this species is Malabar. It is also found in Java (introduced). The material is very scanty on which to judge, but the Nilgiri form seems to vary from this one and when specimens are available from Malabar for comparison both may be found to differ from true *nigricollis*.

Vernacular names.—Mola, Mala (Kanarese); Sasá (Marathi); Kundéli (Waddars and Haran Shikaris); Khargosh (Dekhani).

["Occurring both in open and forest country. Chiefly, but not exclusively, nocturnal. Two young ones born in captivity, in early November, had their eyes open and were just able to move about within 12 hours. This hare is rather savage, and when caught will often attempt to bite, and to scratch with its fore paws, frequently uttering loud squeals. If two are confined together, one will generally fight with and kill the other."—G.C.S.]

RUSA UNICOLOR, Bechs.

The Sambhar.

- 1799. *Cervus unicolor*, Bechstein. Allgeui. Uebers. Vierfus. i., p. 112.
- 1823. *Cervus hippelaphus*, Cuvier. Oss. Foss. ed. 2. N., p. 40.
- 1823. *Cervus equinus*, Cuvier. l. c., p. 45.
- 1825. *Cervus aristotelis*, Cuvier. Oss. Foss. ed. 3, iv., p. 503.
- 1825. *Cervus leschenaulti*, Cuvier. l. c., p. 506.
- 1831. *Cervus jarai*, Hodgson. Glean. Sc. iii., p. 321.
- 1843. *Axis pennantii*, Gray. List Mamm. B.M., p. 180.
- 1891. *Cervus unicolor*, Blanford. Mammalia No. 367.

♂ 295 (imm). Dharwar.

Vernacular names.—Kadave, Kadaba (Kanarese); Méru, Sámbar (Marathi); Sámbar (Dekhani).

AXIS AXIS, Erxl.

The Spotted Deer.

- 1777. *Cervus axis*, Erxl. Syst. Reg. An., p. 312.
- 1831. *Cervus nudipalpebra*, Ogilby. P.Z.S., p. 136.
- 1841. *Axis major* and *minor*, Hodgson. S.A.S.B., x, p. 914.
- 1843. *Axis maculata*, Gray. List. Mam. B.M., p. 178.
- 1891. *Cervus axis*, Blanford. Mammalia No. 368.

802 ♀. Samasgi, S. Dharwar.

Vernacular names.—Sáraga, Sáranga (Kanarese and Waddars); Chital, Chithal, Mirg (all kinds of deer, Marathi and Dekhani); Kárdoh, Saringi (Haran Shikaris).

ANTILOPE CERVICAPRA, L.

The Black Buck.

- 1766. *Capra cervicapra*, Linnæus. Syst. Nat., p. 96.
- 1850. *Antilope bezoartica*, Gray. P.Z.S., p. 117.
- 1891. *Antilope cervicapra*, Blanford. Mammalia No. 357.

♂ 483. Hebli near Dharwar.

♂ 722, 724 (Skull only), 725; ♀ 706. Hawsbhavi, S. Dharwar.

Vernacular names.—Chigari (Kanarese) ; Hàran, Krishnámrig (Marathi); Hàran, Kalwít (Dekhani) ; Gínka (Waddars and Haran Shikaris).

[“ Not occurring in the immediate vicinity of Dharwar, but in the black cotton soil districts that stretch away to the north-east and south-east they are widely distributed and in many places sufficiently numerous to do a considerable amount of damage to the cotton crops. The does and immature bucks have a considerable resemblance to the Spring Buck of South Africa, and their habits are similar in many ways. But there is something stilted and stiff jointed about the movements of a Black Buck which is quite unlike a Spring Buck, which I consider the more graceful and certainly the swifter of the two.”—G.C.S.]

GAZELLA BENNETTI.

The Indian Gazelle.

(For Synonymy, see Report No. 1.)

♂ (imm.) 1357. Near Haveri, Dharwar.

(See also Reports Nos. 1 and 3.)

Vernacular names.—Channachigari, Burari Kúngur (Kanarese) ; Chín-kará (Marathi and Dekhani).

TETRACEROS QUADRICORNIS, Blainv.

The four-horned Antelope.

(For Synonymy, see Report No. 2.)

♂ 800. Samasgi, S. Dharwar.

(See also Report No. 2.)

Vernacular names.—Kónd-kuri, Kan-kuri (Kanarese) ; Jángli-Békra (Marathi and Dekhani) ; these names are also used for *M. vaginalis* the Muntjac.

SUS CRISTATUS, Wagn.

The Indian Wild Boar.

1839. *Sus cristatus*, Wagner. Munch. Gel. Anz. ix., p. 435.

1843. *Sus indicus*, Gray. Cat. Mamm. (no description).

1847. *Sus affinis*, Gray. Cat. Ost. Spec, p. 71.

1860. *Sus indicus*, Blyth. J.A.S.B., xxix,'p. 105.

1891. *Sus cristatus*, Blanford. Mammalia No. 374.

♀ 736, 375, Honkan, S. Dharwar.

Vernacular names.—Handi, Karimikka (Kanarese) ; Dúkar (Marathi) ; Fúndi (Waddars) ; Pandi (Haran Shikaris) ; Suar, Bura Jánwar (Dekhani).

Blanford points out, though he does not accept, Blyth's separation of three forms, under separate names, of the Indian Wild Pig. Blyth accepts the Malabar form as true *cristatus* and separates the trans Gangetic pig as *bengalensis* on account of the less marked constriction of the parietal and

the shorter tail. Blanford distinguishes *cristatus* from the European *scrofa* by the great size and complexity of its posterior molar. The material in the Museum is very scanty but in three adult or old Boars (from Malabar, Sind and 'India') I find that the parietal constriction measures from 28 to 34 mm., the posterior molar 43, and the next two together 35 mm., while in three animals (from Sikhim and the Tarai) these measurements average 46, 37 and 35 mm. respectively.

The question does not directly affect this report for the present specimens are undoubtedly *cristatus*, but I would suggest that the Society start a record of measurements of Indian Pigs. If a direct appeal were made to the Secretaries there should be no difficulty in obtaining body measurements from various Clubs, and the loan or gift of skulls for the desired measurements.

[The coloured plate of the Painted Bat *Kerivoula picta* which accompanies this paper gives a very good idea of the brilliant colouring of this bat.

The red of the wings is very faithfully reproduced but the fur on [the head has hardly been made long enough which makes the ears appear to stand out more than they do in life. No one who has not seen this bat alive or a short time after death can have any idea of the beautiful colouring as it rapidly fades after death and in museum specimens the wings appear a parchment yellow.—EDS.]

A LIST OF BIRDS FROM ARAKAN.

BY

CYRIL HOPWOOD, I.F.S.

Before attempting to deal with the birds met with during my two years' stay in Arakan, perhaps I may be permitted to give a brief description of the district itself, as I feel that this may prove of interest to those unacquainted with this corner of the Indian Empire, and help to explain the presence or absence of certain birds.

Arakan may be divided roughly into three belts. (i) The sea coast, (ii) the foot hills and (iii) the main hill ranges. With regard to (i) a considerable portion of the coast line is fringed with mangrove swamp, in which kingfishers, storks, herons and a few raptorial and passerine birds are found; but there are, in places, considerable areas of sandy beach, backed by open grassy downs, which are a favourite haunt of the small waders, and especially of the Eastern Golden Plover, which is found here in thousands. Between the sea coast and the foot hills lies the paddy land, which is of very considerable extent; this tract is of more interest to the sportsman than to the ornithologist, as there are few birds to be seen (other than the very commonest), except snipe and duck, though the latter are not too numerous, on account of the scarcity of suitable jheels.

Passing over (ii) for the moment, it may be stated roughly that practically the whole of (iii) is dense bamboo jungle, almost treeless, and consequently unsuitable for a great variety of bird life. The exception is the Kyaukpadaung range, which reaches an elevation of about 4,000 feet. This range, which I was lucky enough to visit for a few days in May 1909, is a veritable ornithologist's paradise, and my only regret was that my time there was so limited. At a height of about 3,000 feet the bamboo gives place to very fine evergreen jungle, and at the top of the range there are numerous open grassy glades. As the birds met with here will be dealt with in their proper order, it is unnecessary to remark upon them at this point.

From the foregoing, it follows that the bulk of the passerine birds are to be met with in the foot hills (ii) and the forest growth may be described as mainly of the deciduous type, fairly open, and without much undergrowth. The streams, however, many of which are perennial, are frequently fringed with dense evergreen jungle including palms and canes and the foot hills thus afford a very considerable variety of forest eminently suited to the requirements of passerine and raptorial birds. Further, as there is a good deal of paddy cultivation lying between the lower spurs, there is an additional attraction for such birds as find their food amongst the standing grain and stubbles. In conclusion, I must apologise for the meagreness of my list; and in extenuation would plead guilty to being an oologist rather than an ornithologist; this, added to the extreme difficulty of transporting specimens, accounts for my having undoubtedly passed over large numbers of the smaller passerines, especially warblers, though so far as possible, I made a point of shooting any small bird with which I was unacquainted.

The numbers used are from the "Fauna of British India."

ORDER PASSERES.

FAMILY CORVIDÆ.

4. CORVUS MACRORHYNCHUS.—The Jungle Crow.

Common on sea coast and in foot hills; frequently found feeding on garbage on the beach. I found two nests on 27th March 1909, each with three young, nearly fully fledged.

7. CORVUS SPLENDENS.—The Indian House Crow.

The only house crow found at Akyab and to the north; to the south it extends as far as Kyaukpyu (some 60 miles south of Akyab), where it is found in company with *C. insolens*.

South of Kyaukpyu I failed to meet with it. It is of interest to note that it commences breeding at the end of February, and nests with eggs are numerous by the first week in March. It is much victimised by the Koel, of whom more anon. On 2nd March 1909, I obtained two very abnormal pale blue eggs, with a few large blotches, rather recalling the eggs of the talking Myna (*E. intermedia*), but quite rough to the touch, and glossless.

8. CORVUS INSOLENS.—The Burmese House Crow.

Found with *C. splendens* at Kyaukpyu, but not further north. South of

Kyaukpyu it replaces *C. splendens*. I did not look for nests, but doubtless it breeds in March.

12. *UROCISSA OCCIPITALIS*.—The Red-billed Blue Magpie.

Foot hills of Arakan Yoma, but rare.

14. *CISSA CHINENSIS*.—The Green Magpie.

I only met with the bird once myself, in March 1910, when beating for pig. The only other occasion on which I heard of it was from my friend Mr. Hamilton, of the Forest service, who tells me that when he was sitting up over a corpse for a man-eater, one of these birds came and pecked at the corpse; but whether it was devouring the flesh or searching for insects is uncertain. The incident, however, seems worthy of note. The bird would appear to be rare, as I did not meet with it at Kyaukpadaung.

16. *DENDROCITTA RUFA*.—The Indian Tree-Pie.

Common, especially at Akyab, where it breeds in April and May, though I failed to find its nest.

31. *PARUS ATRICEPS*.—The Indian Grey Tit.

I think I saw some of these birds on Kyaukpadaung, but failed to obtain a specimen. As its range extends throughout Burma it is fairly certain that it occurs in Arakan.

I met with no other birds which I even suspected of belonging to the *Parinae* or *Paradoxornithinae*. The country, on the whole, is unsuitable for these birds, and if any occur they must be very rare and local.

FAMILY CRATEROPODIDÆ.

69. *GARRULAX LEUCOLOPHUS*.—The Himalayan White-Crested Laughing Thrush.

Fairly common. I got a nest with 4 eggs on 8th May 1909 on Kyaukpadaung. I failed to meet with *G. belangeri* at all.

72. *GARRULAX PECTORALIS*.—Black-gorgeted Laughing Thrush.

Common. I saw a partial albino of this species, but failed to secure it.

73. *GARRULAX MONILIGER*.—The Necklaced Laughing Thrush.

Less common than the preceding.

116. *POMATORHINUS SCHISTICEPS*.—The Slaty-headed Scimitar Babbler.

Fairly common, and one of the few birds which inhabits the heavy bamboo jungle.

131. *POMATORHINUS HYPOLEUCUS*.—The Arakan Scimitar Babbler.

Not common, and appears to inhabit the dense bamboo forest. I was fortunate enough to obtain a nest with 2 eggs on 26th January 1909. The nest was of the usual type, and placed in a fork of a bamboo. It was made of the twigs and tendrils of a creeper, and thickly lined with roots and fibres of fern. It measured 13 inches from top of dome to base and 7 inches from entrance, which was at the side to back.

134. *TIMELIA PILEATA*.—The Red-capped Babbler.

Far from common, but occurs occasionally in scrub jungle, usually near the sea.

137. *GAMPSORHYNCHUS RUFULUS*.—The White-headed Shrike-Babbler.

I only once met with these birds, and that was in dense bamboo jungle at the foot of the Sandway Yoma. I secured one immature specimen.

139. *PYCTORHIS SINENSIS*.—The Yellow-eyed Babbler.

Not uncommon in scrub jungle near the sea coast; resident and breeds.

143. *PELLORNEUM MINUS*.—Sharpe's Spotted Babbler.

Mr. Oates was good enough to identify my specimen, whose nest I found on Kyaukpadaung on May 10th, 1909, with 3 eggs. The bird is not uncommon; all the specimens I obtained were similar to that sent to Mr. Oates, so I fancy that *P. subochraceum* does not occur in Arakan.

153. *CORYTHOICHLA STRIATA*.—The Streaked Babbler.

I record this with some diffidence, as the bird was severely damaged by the shot, and could not be preserved; but it appeared, after careful examination, to be referable to this species. It was one of a pair, which appeared to be breeding, though I could not find the nest, and was obtained on Kyaukpadaung on May 9th, 1909.

160. *TURDINUS ABBOTTI*.—Abbot's Babbler.

Not uncommon in evergreen jungle.

163. *ALCIPPE NEPALENSIS*.—Nepal Babbler.

On Kyaukpadaung, where I found a nest on May 10th, 1909. I failed to meet with the bird elsewhere, or with *A. phayrei*.

169. *STACHYRHIS NIGRICEPS*.—The Black-throated Babbler.

Not uncommon. Nest with 4 eggs on Kyaukpadaung on 8th May 1909.

188. *MYIOPHONUS EUGENII*.—The Burmese Whistling Thrush.

Not common.

Other members of the *Brachypterygine* and of the *Sibiine* are likely to occur on Kyaukpadaung, but I should not expect to find them elsewhere.

243. *ÆGITHINA TIPHIA*.—The Common Iora.

Common everywhere.

247. *CHLOROPSIS AURIFRONS*.—The Gold-fronted Chloropsis.

Fairly common.

250. *CHLOROPSIS CHLOROCEPHALA*.—The Burmese Chloropsis.

Common.

254. *IRENA PUELLA*.—The Fairy Blue Bird.

Rather rare; but breeds, as I shot a female on April 8th, 1909, which would have laid in a few days time.

255. *MELANOCHLORA SULTANEA*.—The Sultan Bird.

A single specimen, probably breeding, on Kyaukpadaung, May 1909.

SUB-FAMILY BRACHYPODINÆ.

263. *CRINIGER FLAVEOLUS*.—The White-throated Bulbul.

I believe this to be the common *Criniger* of Arakan. I have undoubted specimens of this bird, but none of *C. burmanicus*. The birds are common, but difficult to shoot.

269. *HYPSIPETES PSAROIDES*.—Himalayan Black Bulbul.

Very common on Kyaukpandaung, where I got numerous nests in May 1909; but I did not see it elsewhere. I failed to meet with *H. concolor*.

272. *HEMIXUS FLAVALA*.—The Brown-eared Bulbul.

Kyaukpandaung, but not elsewhere.

275. *HEMIXUS MACCLELLANDI*.—Rufous-bellied Bulbul.

Kyaukpandaung, not elsewhere.

279. *MOLPASTES BURMANICUS*.—Burmese Red-vented Bulbul.

Common everywhere.

287. *XANTHIXUS FLAVESCENS*.—Blyth's Bulbul.

Mr. Oates identified two specimens from Kyaukpandaung, where they are common. They are smaller than the type specimens, but this Mr. Oates attributes to their being young birds. However, I shot adults which were no larger, and I am inclined to think that this is a small local race; there is no reason to consider it a different species.

288. *OTOCAMPSA EMERIA*.—Bengal Red-whiskered Bulbul.

Common everywhere.

290. *OTOCAMPSA FLAVIVENTRIS*.—Black-crested yellow Bulbul.

Common. I saw a pair collecting nesting materials in March 1910; but I have never found a nest.

306. *PYCNONOTUS BLANFORDI*.—Blanford's Bulbul.

Very rare in Arakan, the country being unsuited to its habits; but occurs occasionally.

310. *MICROPUS MELANOCEPHALUS*.—The Black-headed Bulbul.

I obtained a single specimen on 2nd March 1909, near the Akyab race-course. I searched for a nest, but was not successful.

FAMILY SITTIDÆ.

325. *SITTA FRONTALIS*.—Velvet-fronted Blue Nuthatch.

This bird is very fairly common, and appears to be the only nuthatch commonly found in Arakan. *S. neglecta* was not met with.

FAMILY DICRURIDÆ.

327. *DICRURUS ATER*.—The Black Drongo.

Common.

333. *DICRURUS CINERACEUS*.—The Grey Drongo.

I saw, but failed to secure a species of Grey Drongo on several occasions. I feel almost certain that these birds were *D. cineraceus*.

335. *CHIBIA HOTTENTOTTA*.—The Hair-crested Drongo.

Common everywhere. I have seen flocks of 40 or 50 together. On one occasion they were dashing into the water from an overhanging tree, flying back, and repeating the performance; they seemed to be bathing or playing, not feeding.

339. *BHRINGA REMIFER*.—Lesser Racket-tailed Drongo.

Fairly common.

340. *DISSEMURUS PARADISEUS*.—Larger Racket-tailed Drongo.

Common throughout the foot hills, and along the larger streams. I found several nests, but was unable to get at them. Curiously enough I obtained two nests quite easily accessible, in mango trees, near Rangoon shortly after I left Arakan. The tail feathers of this bird, and of *B. remifer*, are much sought after for use as head-dresses by the Chin hill-tribes.

FAMILY CETHIDIÆ.

I failed to identify any species, but once or twice I saw a wren, probably a species of *Phoebe*.

FAMILY SYLVIIDÆ.

As already stated, I know that I missed many warblers; the appended list is therefore very meagre, and far from representative.

363. *ACROCEPHALUS STENTOREUS*.—Indian Great Reed Warbler. Obtained a single specimen on 28th March 1910.

367. *ACROCEPHALUS AGRICOLA*.—Paddy-field Reed Warbler.

I got a bird on 9th February 1909, which I identified as this species, but unfortunately the bird went bad before I had time to skin it, so I was unable to have my opinion corroborated.

374. *ORTHOTOMUS SUTORIUS*.—Tailor-bird.

Very common. Nests abundantly in May.

379. *CISTICOLA TYTLERI*.—Yellow-headed Fantail Warbler.

Identified for me by Mr. Oates. Cisticolas are very common in suitable localities, but I failed to actually identify any other species. I found no nests.

382. *FRANKLINIA GRACILIS*.—Franklin's Wren-Warbler.

Appears common. Numerous nests were obtained by my friend, Mr. Thorn, near Paletwa in N. Arakan.

424. *ACANTHOPNEUSTE MAGNIROSTRIS*.—Large-billed Willow-Warbler.

I record this species with some diffidence, as the single specimen obtained was moulting, and was damaged by the shot. But it was without doubt an *Acanthopneuste*; and judging by the dark colour, attributable to this species. Date 12th April 1910.

463. *PRINIA FLAVIVENTRIS*.—Yellow-bellied Wren-Warbler.

Common and breeds.

468. *PRINIA BLANFORDI*.—Burmese Wren-Warbler.

I cannot swear to the species, but it is either this or *P. inornata*. Not common.

FAMILY LANIIDÆ.

474. *LANIUS COLLURIROIDES*.—The Burmese Shrike.

Common in the winter. Leaves about April, and first seen on return on October 3rd, 1909.

481. *LANIUS CRISTATUS*.—Brown Shrike.

Very common near the sea coast from August to April. Mr. Oates identified the bird for me, but it was not quite typical. I much regret not having collected a series, though I see no reason for suspecting the occurrence of a new species. But it is just possible.

484. *HEMIPUS PICATUS*.—Black-backed Pied Shrike.

I several times saw birds which I presume belonged to this species, and shot and identified one on 20th March 1910.

488. *TEPHRODORNIS PONDICERIANUS*.—Common Wood Shrike.

Common in suitable localities. I failed to obtain any other species of *Tephrodornis*.

491. *PERICROCOTUS FRATERCULUS*.—Burmese Scarlet Minivet.

I did not actually obtain a specimen, as the birds were very rare, but I presume the few seen were of this species.

500. *PERICROCOTUS PEREGRINUS*.—Small Minivet.

Common. Breed in the Casuarina trees in Akyab cantonments.

510. *GRAUCULUS MACII*.—Large Cuckoo Shrike.

Very common and noisy. I was lucky enough to get a nest, with two nearly fresh eggs on 30th March 1909, to which I was attracted by the agitation of the birds. It was only when my man climbed the tree that the nest was discovered, as it was almost invisible from below, being most cunningly concealed in a forked branch.

512. *ARTAMUS FUSCUS*.—Ashy Swallow Shrike.

Very common. Breeds about April in the Casuarinas in Akyab.

FAMILY ORIOOLIDÆ.

521. *ORIOULUS MELANOCEPHALUS*.—Indian Black-headed Oriole.

Common everywhere.

FAMILY EULABETIDÆ.

524. *EULABES INTERMEDIA*.—Indian Grackle.

Not very common. Obtained eggs in N. Arakan in May. As elsewhere, a favourite cage bird. One of a pair which I had in my aviary was a brilliant talker and mimic, and could also whistle tunes.

FAMILY STURNIDÆ.

538. *STURNIA MALABARICA*.—The Grey-headed Myna.

Common. Breeds in holes in the Casuarinas in April and May in Akyab.

549. *ACRIDOTHERES TRISTIS*.—Common House Myna.

Common everywhere.

552. *ÆTHIOPSAR FUSCUS*.—The Jungle Myna.

Common in all suitable localities, but I failed to find a nest.

556. *STURNOPASTOR SUPERCILIARIS*.—Burmese Pied Myna.

Very common and breeds in large numbers near towns and villages in May. Mr. Oates writes under *S. contra*: "A specimen from Arakan in the British Museum is a typical *S. contra*." Every single bird which I met with, and I shot some dozens, and examined many more through glasses at close range were typical *S. superciliaris*. The British Museum specimen must, therefore, have been a rare straggler.

FAMILY MUSCICAPIDÆ.

Flycatchers are scarcely as numerous as might be expected, and I failed to meet with several usually common species. I am inclined to think that I did not overlook many, as I take a rather particular interest in this family.

558. *HEMICHELIDON SIBIRICA*.—Sooty Fly-catcher.

Apparently confined to Kyaukpadaung, where I obtained a specimen on May 7th, 1909. From the date, I should judge it to be resident.

562. *SIPHIA ALBICILLA*.—Eastern Red-breasted Fly-catcher.

Common winter migrant approximately from November to March. All in female dress.

569. *CYORNIS MELANOLEUCUS*.—Little Pied Fly-catcher.

Common in Kyaukpadaung at about 4,000 feet, not seen elsewhere.

575. *CYORNIS RUBECULOIDES*.—Blue-throated Fly-catcher.

Appears common.

592. *CULICICAPA CEYLONENSIS*.—Grey-headed Fly-catcher.

Common.

594. *NILTAVA SUNDARA*.—Rufous-bellied Niltava.

Though several times seen, I failed to shoot a specimen; but I am well acquainted with the bird which I obtained in the Upper Chindwin, not a great distance from Arakan as the crow (or Niltava!) flies, so I think it may safely be recorded.

599. *TERPSIPHONE AFFINIS*.—Burmese Paradise Fly-catcher.

Fairly common in suitable localities. I got a nest from an evergreen stream with two fresh eggs on 13th April 1909. The nest was placed in the angle between the stem and leaf of a wild canna. Cock bird in chestnut plumage.

605. *RHIPIDURA ALBICOLLIS*.—White-throated Fantail Fly-catcher.

Not common. One of the birds which haunts the gloomy bamboo forests of the Yoma, where I first observed it.

FAMILY TURDIDÆ.

608. *PRATINCOLA CAPRATA*.—Common Pied Bush Chat.
Common and breeds.

610. *PRATINCOLA MAURA*.—Indian Bush Chat.
Common winter migrant.

631. *HENICURUS GUTTATUS*.—Eastern Spotted Forktail.
On Kyaukpadaung only. I obtained a nest of the usual Forktail type with three fresh eggs on May 8th, 1909. The nest was in a cleft of a rock over water.

633. *HENICURUS IMMACULATUS*.
Common along all jungle streams, and occasionally seen in Akyab cantonments. Breeds March and April.

638. *CHIMARRHORNIS LEUCOCEPHALUS*.—White-capped Redstart.
Not common, but occasionally met with near waterfalls in perennial streams. Probably breeds, as I have seen it as late as April.

646. *RHYACORNIS FULIGINOSUS*.—Plumbeous Redstart.
A single female. N. Arakan. Cold weather.

663. *COPSYCHUS SAULARIS*.—Magpie-Robin.
Common.

664. *CITTOCINCLA MACRURA*.—Shama.
Not common.

686. *GEOCICHLA CITRINA*.—Orange-headed Ground Thrush.
Only met with on Kyaukpadaung, in evergreen jungle at about 4,000 feet. I got three nests on May 8th and 9th, 1909, containing respectively 1 fresh, 3 slightly incubated and 2 hard set eggs. The nests were of the usual type, placed in the fork of a sapling in each case.

693. *PETROPHILA CYANUS*.—Western Blue Rock Thrush.
Common from October to about April. A few arrive in September. This bird occasionally sings most beautifully but very rarely.

698. *OREOCINCLA DAUMA*.—Small-billed Mountain Thrush.
Ruchaung, N. Arakan, March 1910. Appears rare.

FAMILY PLOCEIDÆ.

720. *PLOCEUS BAYA*.—The Baya.
Common.

723. *PLOCEUS MANYAR*.—Striated Weaver-bird.
Common.

725a. *MUNIA ORYZIVORA*.—The Java Sparrow.
I met with a flock of six on September 26th, 1909, when snipe shooting: they were feeding on grass seeds, like common munias. Again, in March 1910 I saw a pair in Akyab cantonments and a single specimen in the paddy fields in April 1910. The birds are known to the Arakanese villagers, so the species may be taken as thoroughly established in Arakan.

726. *MUNIA ATRICAPILLA*.—Chestnut-bellied Munia.

Common.

727. *UROLONCHA ACUTICAUDA*.—Hodgson's Munia.

Common. Breeds early in May, when I obtained several nests with fresh eggs.

735. *UROLONCHA PUNCTULATA*.—Spotted Munia.

Common everywhere.

739. *SPORÆGINTHUS FLAVIDIVENTRIS*.—Burmese Red Munia.

Fairly common. Found a nest of young birds at the end of August 1909 in a screw-pine on a bund in a paddy field.

FAMILY FRINGILLIDÆ.

761. *CARPODACUS ERYTHRINUS*.—Common Rose Finch.

A single specimen at Myohaung, 3rd March 1910. I am told the bird is not uncommon in this particular locality. It is one of the few places in the "plains" of Arakan, or rather of the Akyab district of Arakan, where there is a fair extent of jungle, other than mangrove jungle, and is consequently a good place for birds. The woodland near Myohaung would repay more careful exploration than I was able to give.

776. *PASSER DOMESTICUS*.—The House Sparrow.

It may be of interest to record that this bird is not found north of Kaladan on the Kaladan river. It does not occur at the little town of Paletwa, the head-quarters of N. Arakan; nor is it replaced by any other sparrow. At Akyab, I found a nest containing young sparrows built into a kite's nest, in which were young kites and the sparrows were quite unmolested. The sparrows also use old kingfisher's burrows, which are very numerous near Akyab, as nesting sites.

780. *PASSER CINNAMOMEUS*.—Cinnamon Tree Sparrow.

Rare.

I only identified one bunting, though I saw others.

797. *EMBERIZA AUREOLA*.—Yellow-breasted Bunting.

Occurs in large flocks, and is common in the cold weather months. I observed them as late as April.

FAMILY HIRUNDINIDÆ.

807. *CHELIDON NEPALENSIS*.—Hodgson's Martin.

Common at Kyaukpadaung, where it breeds on the cliffs in April and May. The nests, as a rule, are inaccessible and I did not get eggs. The birds are occasionally met with, but are rare elsewhere.

809. *COTILE SINENSIS*.—Indian Sand Martin.

Common.

814. *HIRUNDO GUTTURALIS*.—Eastern Swallow.

Common everywhere in winter.

815. *HIRUNDO TYTLERI*.—Tytler's Swallow.

Fairly common.

817. *HIRUNDO JAVANICA*.—Nilgiri House Swallow.

I failed to satisfy myself as to whether these birds are resident throughout the year, but I obtained eggs from some cliffs by the sea at Kyaukpugu at the end of March, and the birds are common in winter. Oates does not record this bird from Burma.

818. *HIRUNDO SMITHII*.—Wire-tailed Swallow.

Common. Nest with 4 eggs from a cliff on the Lemru river, N. Arakan April 12, 1909.

822. *HIRUNDO NEPALENSIS*.—Hodgson's Striated Swallow.

Appears to occur only in N. Arakan, where I met with it in April and May fairly commonly.

FAMILY MOTACILLIDÆ.

Wagtails are very numerous in Arakan. The following were actually identified, but there are probably others.

826. *MOTACILLA ALBA*.—White Wagtail.

Common everywhere.

828. *MOTACILLA OCULARIS*.—Streak-eyed Wagtail.

Upper Kaladan, N. Arakan, November 1908.

832. *MOTACILLA MELANOPE*.—Gray Wagtail.

Common in winter; earliest date of appearance September 20, 1909.

834. *MOTACILLA FLAVA*.—Blue-headed Wagtail.

Not uncommon.

839. *LIMONIDROMUS INDICUS*.—Forest Wagtail.

Twice seen in January and February 1909 but I failed to secure either specimen. I have shot it elsewhere in Burma, and once identified. It is easily recognised, so may be unhesitatingly recorded.

845. *ANTHUS RICHARDI*.—Richard's Pipit.

Common.

847. *ANTHUS RUFULUS*.—Indian Pipit.

Common everywhere, and I saw a pair carrying nesting materials in February; but as I was on the march, I did not look for the nest.

850. *ANTHUS ROSACEUS*.—Hodgson's Pipit.

A young bird, Akyab racecourse, 24th November 1908. Just assuming the pinkish tinge on head and neck; breast and sides heavily streaked. The specimen, which I had intended to preserve, was unfortunately stolen from my verandah by a crow!

FAMILY ALAUDIDÆ.

861. *ALAUDA GULGULA*.—Indian Sky-Lark.

Resident and breeds from March to May, in both of which months I got nests.

870. *MIRAFRA ASSAMICA*.—Bengal Bush Lark.

Very common and resident.

FAMILY NECTARINIIDÆ.

The birds of this family are very plentiful in Arakan, but I only identified a few.

884. *ÆTHOPYGA CARA*.—Tenasserim Yellow-backed Sun-bird.

Oates says that it is "doubtful if this sun-bird extends to Arakan or not." I can now positively state that it is common in Arakan, being found usually on the edge of the forest, near the paddy fields.

895. *ARACHNECTHRA ASIATICA*.—Purple Sun-bird.

Common.

896. *ARACHNECTHRA HASSELTII*.—Van Hasselt's Sun-bird.

This beautiful Sun-bird is not uncommon.

898. *ARACHNECTHRA FLAMMAXILLARIS*.—Burmese Yellow-breasted Sun-bird.

Common.

903. *ANTHOTHREPTES MALACCENSIS*.—Brown-throated Sun-bird.

Fairly common.

909. *ARACHNOTHERA LONGIROSTRIS*.—Little Spider-Hunter.

Fairly common, but I never succeeded in finding a nest, though I think I must have been near one more than once, to judge from the excitement of the birds.

FAMILY DICEIDÆ.

912. *DICEUM CRUENTATUM*.—Scarlet-backed Flower Pecker.

Common.

914. *DICEUM CHRYSORRHÆUM*.—Yellow-vented Flower Pecker.

Rather rare.

919. *DICEUM ERYTHORHYNCHUS*.—Tickell's Flower Pecker.

Not uncommon. A bold familiar little bird, which will settle close to one, and is far too intent on its own business to take much notice of one's movements.

I also saw, once or twice, a bird which I should be inclined to attribute to the genus *Prionochilus*; but as I did not obtain a specimen I cannot venture any more definite opinion.

FAMILY PITTIDÆ.

927. *PITTA NEPALENSIS*.—Blue-naped Pitta.

Not common. The jungle is not suitable for Pittas, but *P. cyanea* and *P. cyanoptera* are also recorded from Arakan, and would probably be found on Kyaukpadaung.

This concludes the Passeres, of which I find I have actually identified 121 species. There is therefore plenty of scope for further research!

ORDER EURYLÆMI.

FAMILY EURYLEMIDÆ.

I only met with two species, both on Kyankpaudang. These were :—

943. *SERILOPHUS RUBRIPYGUS*.—Gould's Broadbill.

944. *PSARISOMUS DALHOUSIE*.—Long-tailed Broadbill.

I got nests of both, May 7th to 9th, but whereas I only got one of *P. dalhousie*, I got about half a dozen of *S. rubripygus*, and frequently saw the birds.

ORDER PICI.

FAMILY PICIDÆ.

In my nine years' experience of Burma, during which I have served in some ten "districts," I have never struck a place in which the *Pici* are so scarce as in Arakan. This is doubtless accounted for by the immense areas of bamboo jungle, and the paucity of tree growth; but even in ordinary tree jungle, woodpeckers are far less numerous than usual. I wonder if the proximity of the sea, and the heavy rainfall has anything to do with this. The following list is complete as far as my observations went, as I did not see a single woodpecker which I failed to identify.

951. *GEVINUS CHLOROLOPHUS*.—Small Himalayan Yellow-naped Woodpecker.

Common.

958. *GEVINULUS GRANTIA*.—Northern Pale-headed Woodpecker.

Fairly common in the bamboo jungle.

967. *DENDROCOPUS MACH*.—Fulvous-breasted Pied Woodpecker.

Common; nest in Akyab in a bamboo which had been used as a post in a deserted hut, June 1909, with three young.

988. *TIGA JAVANENSIS*.—Common Golden-backed Three-toed Woodpecker.

Very common.

992. *CHRYSOCOLAPTES GUTTICRISTATUS*.—Tickell's Golden-backed Woodpecker.

Common.

995. *HEMICEROSUS CANENTE*.—Heart-spotted Woodpecker.

Fairly common.

996. *HEMILOPHUS PULVERULENTUS*.—Great Slaty Woodpecker.

I only saw one pair, and found the nest hole on May 10th, 1910, but it proved inaccessible to my great disappointment. It was in a huge "Kauyin" (wood-oil) tree, fully eighty feet from the ground.

1002. *SASIA OCHRACEA*.—Rufous Piculet.

Common.

ORDER ZYGODACTYLI.

FAMILY CAPITONIDÆ.

1009. *THEREICERYX LINEATUS*.—Lineated Barbet.

Common.

1012. *CYANOPS ASIATICA*.—Blue-throated Barbet.

Common. I got a nest with two fresh eggs on the road to Kyaukpandaung at about 3,000 feet, May 7th, 1909.

1019. *XANTHOLÆMA HÆMATOCEPHALA*.—"Coppersmith."

Very common.

ORDER ANISODACTYLI.

FAMILY CORACIADÆ.

1023. *CORACIAS AFFINIS*.—Burmese Roller.

Very common.

1025. *EURYSTOMUS ORIENTALIS*.—Broad-billed Roller.

Fairly common.

FAMILY MEROPIDÆ.

1026. *MEROPS VIRIDIS*.—Common Indian Bee-eater.

1027. *MEROPS PHILIPPINUS*.—Blue-tailed Bee-eater.

Appears to be more or less migratory, as I noticed both in 1909 and 1910 that it was far more abundant in the breeding season, April and May, than at other times.

1030. *MELITTOPHAGUS SWINHOII*.—Chestnut headed Bee-eater.

Common.

1031. *NYCTIORNIS ATHERTONI*.—Blue-bearded Bee-eater.

Not uncommon. I found a nest early in May, 1910, but without eggs.

FAMILY ALCEDINIDÆ.

1033. *CERYLE VARIA*.—Indian Pied Kingfisher.

Very common. I found young birds just able to fly on March 21st, 1909; and got a nest with 5 eggs on April 13th, 1910.

1034. *CERYLE LUGUBRIS*.—Himalayan Pied Kingfisher.

N. Arakan, Lemin river only, but common there.

1035. *ALCEDO ISPIDA*.—Common Kingfisher. Common.

1041. *PELARGOPSIS AMAUROPTERA*.—Brown-winged Kingfisher.

Common near the sea coast, and in mangrove swamps. This bird has the habit of plunging into the surf, and settling on the sand while it secures its prey, allowing the waves to break over it.

1043. *PELARGOPSIS GURIAL*.—Brown-headed Stork-billed Kingfisher.

Common, but keeps most to the fresh water, rarely coming down to tidal limits. *P. amauroptera*, on the contrary, I never found frequenting fresh water.

1044. HALCYON SMYRNENSIS.—White-breasted Kingfisher.

Very common.

1045. HALCYON PILEATA.—Black-capped Kingfisher.

Very common in tidal jungle, and along brackish creeks. Common as it was, I totally failed to find a nest.

1047. SAUROPATIS CHLORIS.—White-collared Kingfisher.

Common in same habitat as *H. pileata*, and very noisy. This bird undoubtedly breeds in holes of dead trees, and apparently excavates its own burrow. I found several such holes, but failed to obtain eggs. My friend Mr. Wickham, however, got them from trees in the Andamans, and I have a clutch which he gave me. One of my clerks told me that there was a nest of this species in a tree in his compound at Akyab a few years ago. The bird is commonly seen in the gardens in Akyab town, and I have no reason to disbelieve his statement.

FAMILY BUCEROTIDÆ.

1051. DICHOCEROS BICORNIS.—Great Hornbill.

Common.

1053. ANTHRACOCEROS ALBIROSTRIS.—Indo-Burmese Pied Hornbill.

Common. I had two of these birds as pets, and they were extremely tame, flying about loose in the compound, and coming into the house when they wanted food. As an amusing pet, this bird is hard to beat; but it is a tyrant in an aviary, and will kill small birds.

1054. RHYTIDOCEROS UNDULATUS.—Malayan Wreathed Hornbill.

Not common, confined to the hills, and very shy and wary. I did not succeed in collecting a specimen, but identified them with the aid of field glasses.

FAMILY UPUPIDÆ.

1067. UPUPA INDICA.—Indian Hoopoe.

Common. I once took a single young bird from a nest (the others had, I suppose, flown), and put it in a cage in my verandah, fully 300 yards from its nest. Within a few hours the old birds were feeding it, and continued to do so for two days, when it made its escape.

ORDER MACROCHIRES.

FAMILY CYPSELIDÆ.

1074. CYPSELUS SUBFERCATUS.—Malayan House Swift.

Breeds in hundreds on Kyaukpandaung in May, but the nests were inaccessible.

1076. TACHORNIS INFUMATUS.—Eastern Palm Swift.

Common.

1078. CHÆTURA INDICA.—Brown-necked Spine-tail.

Common.

FAMILY CAPRIMULGIDÆ.

1091. *CAPRIMULGUS ASIATICUS*.—Common Indian Nightjar.
Common.

1093. *CAPRIMULGUS MACRURUS*.—Horsfield's Nightjar.
Common.

1096. *LYNCORNIS CERVINICEPS*.—Great Eared Nightjar.
Fairly common.

ORDER TROGONES.

FAMILY TROGONIDÆ.

1101. *HARPACTES ERYTHROCEPHALUS*.—Red-headed Trogon.
Common.

1103. *HARPACTES ORESCIUS*.—Yellow-breasted Trogon.

I made the acquaintance of this beautiful Trogon for the first time in Arakan. It is not common.

ORDER COCCYGES.

FAMILY CUCULIDÆ.

1104. *CUCULUS CANORUS*.—The Cuckoo.
Two in September, 1908. Presumably migrating.

1107. *CUCULUS MICROPTERUS*.—Indian Cuckoo.
Fairly common.

1108. *HIEROCOCYX SPARVERIODES*.—Large Hawk-Cuckoo.
Not common.

1113. *CACCAMANTIS MERULINUS*.—Rufous-bellied Cuckoo.
Not common.

1114. *PENTHOCERYX SONNERATI*.—Banded Bay Cuckoo.
Rare.

1119. *COCCYSTES COROMANDUS*.—Red-winged Crested Cuckoo.

Met with occasionally but not commonly. I also have it in my mind that I saw *C. jacobinus*, and failed to note it in my book, so it must be considered a "doubtful starter."

1120. *EUDYNAMIS HONORATA*.—Indian Koel.

For a koël-ridden place, commend me to Akyab. There are more koëls to the square yard, I should imagine, than in any other portion of the Indian Empire. I am inclined to agree that the bird is partially migratory, as it is far more common in the breeding season than at other times. As stated above *C. splendens* breeds in Arakan in March, and the koël of course, follows suit. During the first week in March 1909, I got koël's eggs *ad lib.* and I believe I established a record, on March 4, when I took seven koël's eggs from one crow's nest (and incidentally performed a public service). There were no crow's eggs in this nest, and the koël's

eggs were all fresh. The eggs were of three distinct types, and made three natural clutches of 3, 2, and 2. I presume three koëls were laying in this nest, and the crows had given it up as a bad job. I saw crows feeding young koëls as late as July.

1123. *RHOPODYTES TRISTIS*.—Large Green-billed Malkoha.

Fairly common.

1130. *CENTROPUS SINENSIS*.—Common Corocal.

Common.

ORDER PSITTACI.

FAMILY PSITTACIDÆ.

1136. *PALEORNIS INDOBURMANICUS*.—Large Burmese Paroquet.
Common.

1138. *PALEORNIS TORQUATUS*.—Rose-ringed Paroquet.
Common.

1145. *PALEORNIS FASCIATUS*.—Red-breasted Paroquet.
By far the commonest parrot in Arakan.

1150. *LORICULUS VERNALIS*.—Indian Loriquest.
Common.

P. schisticeps or *finschi* probably occurs,* but I failed to meet with either.

ORDER STRIGES.

FAMILY ASIONIDÆ.

1164. *KETUPA ZEYLONENSIS*.—Brown Fish Owl.
Common, and breeds in Akyab.

1178. *SCOPS BAKKAMENA*.—Collared Scops Owl.
Common. I found two nests with young in April 1909 and 1910.

1180. *ATHENE BRAMA*.—Spotted Owlet.
Common.

1187. *NINON SCUTULATA*.—Brown Hawk Owl.

I know the call of this owl well, having shot them, whilst shooting, in the Chindwin. I did not actually see a specimen in Arakan, but frequently heard them calling, so include it in my list.

ORDER ACCIPITRES.

FAMILY PANDIONIDÆ.

1189. *PANDION HALIAETUS*.—The Osprey.
A not uncommon winter visitor, usually met with near the sea.

FAMILY VULTURIDÆ.

1191. *OTOGYPS CALVUS*.—Black Vulture.
Rather rare.

1195. *GYPS TENUIROSTRIS*.—Himalayan Long-billed Vulture.
Common.

1196. *PSEUDOGYPS BENGALENSIS*.—Indian White-backed Vulture.
Very common.

FAMILY FALCONIDÆ.

1212. *SPIZAËTUS LIMNAËTUS*.—Changeable Hawk Eagle.
Not common: but I was lucky enough to get a nest, with a single hard set egg, on April 22nd, 1910.
1217. *SPILORNIS CHEELA*.—Crested Serpent Eagle.
The commonest eagle in Arakan, found everywhere.
1223. *HALIAËTUS LEUCORYPHUS*.—Pallas' Fishing Eagle.
Fairly common. Found a nest without eggs on 9th November 1909.
1224. *HALIAËTUS LEUCOGASTER*.—White-bellied Sea Eagle.
Very common near the sea. I found several nests in October and November, but always failed to get eggs.
1226. *POLIOËTUS ICHTHYAËTUS*.—Large Gray-headed Fishing Eagle.
Fairly common. Nest with almost fledged chick on January 26th, 1910.
1228. *HALISTUR INDUS*.—Brahminy Kite.
Very common.
1229. *MILVUS GOVINDA*.—Common Pariah Kite.
Very common.
1232. *ELANUS CERULEUS*.—Black-winged Kite.
Rare.
1233. *CIRCUS MACRURUS*.—Pale Harrier.
Very common in winter.
1236. *CIRCUS MELANOLEUCUS*.—Pied Harrier.
Common in winter.
1237. *CIRCUS ÆRUGINOSUS*.—Marsh Harrier.
Common in winter.
1244. *ASTUR BADIUS*.—The Shikra.
Common.
1254. *FALCO PEREGRINUS*.—Peregrine Falcon.
Not common.
1265. *TINUNCULUS ALAUDARIUS*.—Kestrel.
Common, especially in the hot weather. I noticed large numbers of Kestrels on Akyab race course, in March and April; on shooting a specimen, I found that it had been feeding almost entirely on a kind of large cricket, which is very abundant at this time of year; and which doubtless attracts the hawks.

ORDER COLUMBÆ.

FAMILY COLUMBIDÆ.

1271. *CROCOPUS PHENICOPTERUS*.—Bengal Green Pigeon.
Rare.

1273. *OSMOTRERON PHAYREI*.—Ashy-headed Green Pigeon.

Very common.

1278. *OSMOTRERON BICINCTA*.—Orange-breasted Green Pigeon.

Fairly common. On March 13, 1909, I got a nest with two slightly incubated eggs. The nest was placed in a pollarded stump, only a few feet from the ground, and the eggs were plainly visible when the bird flew away.

1281. *TRERON NEPALENSIS*.—Thick-billed Green Pigeon.

Not common.

1284. *CARPOPHAGA AENEAE*.—Green Imperial Pigeon.

Common, and breeds from February to May, as I have found nests in both months.

1289. *MYRISTICIVORA BICOLOR*.—Pied Imperial Pigeon.

This I believe to be the first record from Burma, at all events from the mainland. One of my men shot three from a flock of four in February 1910, a little south of Sandoway; one of the skins was sent to the Bombay Natural History Society. The villagers at once recognised the birds, and say they are numerous, and breed, in the islands off the coast, visiting the mainland in the winter months. The crops of the birds shot were stuffed with wild figs; and the birds were far superior to *C. aenea* for the table.

1291. *CHALCOPHAPS INDICA*.—Bronze-winged Dove.

Common.

1304. *TURTUR ORIENTALIS*.—Rufous Turtle Dove.

Common.

1308. *TURTUR TIGRINUS*.—Malay Spotted Dove.

Very common.

1311. *CENOPELIA TRANGUEBARICA*.—Red Turtle Dove.

Fairly common.

ORDER GALLINÆ.

FAMILY PHASIANIDÆ.

1325. *PAVO MUTICUS*.—Burmese Peafowl.

Occurs sparingly in the Sandoway District.

1327. *POLYPECTRUM CHINQUIS*.—Gray Peacock-Pheasant.

Not uncommon in the N. Arakan Hill tracts.

1328. *GALLUS FERRUGINEUS*.—Red Jungle Fowl.

Common.

1340*d*. *GENNÆUS CUIVIERI*.

Silver Pheasants are not common as a rule, as the Jungle is unsuitable. But in N. Arakan they are fairly plentiful throughout and along the Ru stream, a feeder of the Lemru, they positively swarm. The specimens collected by me, and sent to the late Mr. Oates, were identified by him

as *G. prendergarsti*. However, on comparison with the types in the British Museum, my specimens were found to be identical with *G. cuivieri* and were identified and labelled by Mr. Ogilvie Grant as such. I only met with the one variety, but one male approximates to typical *G. horsfieldi*. This came from the Chittagong border.

1354. *EXCALFACTORIA CHINENSIS*.—Blue-breasted Quail.

Fairly common on swampy grazing grounds. This bird seems to have a very strong scent, as my spaniel used always to get very keen when they were about.

1364. *ARBORICOLA INTERMEDIA*.—Arakan Hill Partridge.

Common almost everywhere in the jungle, and easily detected once its call is known. Breeds in March, when I obtained eggs.

1365. *ARBORICOLA ATRIGULARIS*.—White-cheeked Hill Partridge.

Rare. I only obtained one specimen, at about 2,000 feet, on the road to Kyaukpandung.

ORDER HEMIPODII.

FAMILY TURNICIDÆ.

1382. *TURNIX PUGNAX*.—Bustard Quail.

Found almost everywhere, in suitable localities, but never common in any one place.

1386. *TURNIX BLANFORDI*.—Burmese Button Quail.

Rare.

ORDER GRALLÆ.

As soon as we arrive at the water birds, waders, herons, storks, etc., the number of common species rapidly increases, as might be expected in a district offering such a variety of suitable localities, as does the coast line of Arakan.

FAMILY RALLIDÆ.

1389. *HYPOTÆNIDIA STRIATA*.—Blue-breasted Rail.

Very common.

1401. *AMAUROORNIS PHENICURUS*.—White-breasted Moorhen.

Very common; breeds in Akyab town.

1402. *GALLINULA CHLOROPUS*.—Moorhen.

Common.

1403. *GALLICREX CINEREUS*.—Kora.

Common.

1404. *PORPHYRIO POLIOCEPHALUS*.—Purple Moorhen.

Rather rare.

1405. *FULICA ATRA*.—Coot.

Not common.

Species of *Poozana* and *Rallina* also occur, but I failed to identify any.

FAMILY HELIORNITHIDÆ.

1406. *HELIOPAIS PERSONATA*.—Masked Finfoot.

One evening, whilst fishing with my friend Mr. Pickthall, in a deep pool on the Ru stream, a bird which we took to be a duck, flew down and settled with a loud grunting quack. My friend fired, and the bird, hard hit, struggled into the elephant grass. On being driven out, it swam and dived well for several minutes, until secured; all the time it kept uttering its monosyllabic grunt. It proved to be a fine male, and the skin is now in Mr. Pickthall's possession. The date was March 9th, 1910.

FAMILY GRUIDÆ.

1409. *GRUS ANTIGONE*.—The Sarus.

Cranes are not common: the only one I shot proved to be *G. antigone* and not *G. sharpii*.

1411. *ANTHROPOIDES VIRGO*.—Demoiselle Crane.

On New Year's Day, 1909, I saw three of these birds, which I easily identified with my glass, though they were too wary to allow of my shooting any. There were, apparently, one old and two young birds.

ORDER LIMICOLÆ.

FAMILY ŒDICNEMIDÆ.

1419. *ESACUS RECURVIROSTRIS*.—Great Stone Plover.

Rare, but I met with it at Kyaukpyu. In N. Aracan I saw birds which were probably *E. scolopar*.

FAMILY GLAREOLIDÆ.

1425. *GLAREOLA ORIENTALIS*.—Large Indian Pratincole.

Very common and resident. In 1909 I was too late for eggs, but found a young bird. In 1910, I determined to get eggs, and after several days' hunting got the knack of it, when my Burman "boy" and I succeeded in finding about twenty nests. The birds were breeding in paddy stubble, near the sea, just outside Akyab town; the nests are best found by flushing the birds, and then watching them return, when they run to the nest and squat down. The nests were all found during the last week in April.

1427. *GLAREOLA LACTEA*.—Small Indian Pratincole.

Much less common than *G. orientalis*, but resident and breeds.

FAMILY PARRIDÆ.

1428. *METOPODIUS INDICUS*.—Bronze-winged jacana.

Common.

1429. *HYDROPHASIANUS CHIRUGUS*.—Pheasant-tailed jacana.

Fairly common.

FAMILY CHARADRIIDÆ.

1430. *STREPSILAS INTERPRES*.—Turnstone.
Four birds on October 5th, 1909, on the rocks near Fakir point, at Akyab.
1432. *SARCOGRAMMUS ATRINUCHALIS*.—Burmese Wattled Lapwing.
Common.
1435. *HOPLOPTERUS VENTRALIS*.—Indian Spur-winged Plover.
Fairly common.
1439. *CHARADRIUS FULVUS*.—Eastern Golden Plover.
Occurs in vast numbers from September to May, by which time the birds are assuming breeding plumage. I kept one in my aviary for several months, and it thrived exceedingly on a diet of white ants. It was liberated in May.
1441. *SQUATAROLA HELVETICA*.—Grey Plover.
A not uncommon winter migrant.
1442. *ÆGIALITIS GEOFFROYI*.—Large Sand Plover.
A common shore bird, from August to February or March.
1447. *ÆGIALITIS DUBIA*.—Little Ringed Plover.
Very common.
1451. *HIMATOPUS CANDIDUS*.—Black-winged Stilt.
Rare.
1454. *NUMENIUS ARQUATA*.—Curlew.
Very common. I have seen them as late as June and as early as August.
1455. *NUMENIUS PHŒOPUS*.—Whimbrel.
Equally common; returns in August, and appears to leave about April or May.
1460. *TOTANUS HYPOLEUCUS*.—Common Sandpiper.
Very common.
1461. *TOTANUS GLAREOLA*.—Wood Sandpiper.
Very common.
1462. *TOTANUS OCHROPUS*.—Green Sandpiper.
Very common.
1463. *TOTANUS STAGNATILIS*.—March Sandpiper.
Rare.
1464. *TOTANUS CALIDRIS*.—Redshank.
Very common; August to April or May.
1465. *TOTANUS FUSCUS*.—Spotted Redshank.
Common.
1466. *TOTANUS GLOTTIS*.—Greenshank.
Very common; August to March.
1472. *TRINGA RUFICOLLIS*.—Eastern Little Stint.
Fairly numerous.
1482. *SCOLOPAX RUSTICOLA*.—Woodcock.
A very rare visitor. One was shot in the winter of 1908.

1484. *GALLINAGO CÆLESTIS*.—Common Snipe.

Less common than *G. stenura*. The first shot was on September 25th 1910, and on October 10th, 1909. Last shot about end of January.

1485. *GALLINAGO STENURA*.—Pintail Snipe.

Very plentiful. Arrive between August 20th and 25th and stragglers remain till the end of April.

1488. *ROSTRATULA CAPENSIS*.—Painted Snipe.

Unaccountably rare, as there are many suitable localities.

ORDER GAVIÆ.

FAMILY LARIDÆ.

1489. *LARUS ICHTHYÆTUS*.—Great Black-headed Gull.

On November 20th, 1909, I observed three very large Gulls, in company with *G. brunneicephalus*. They were too wary to allow of my shooting one, but from what I could make out through my glass, I think they must have been *L. ichthyætus*.

1491. *LARUS BRUNNEICEPHALUS*.—Brown-headed Gull.

The Gulls arrived about the end of October, and are then commonly met with throughout the winter. In 1909 they left in April, when most had assumed breeding plumage; in 1910, breeding plumage was assumed about the same time, but they did not leave till the beginning of May.

1496. *HYDROCHELIDON HYBRIDA*.—Whiskered Tern.

Commonest in winter, but as there are always a few about, it probably breeds. As the whole country is under water in the rains, there is an ample choice of nesting sites.

1502. *STERNA BERGII*.—Large Crested Tern.

Very common. According to Hume, they used to breed on Oyster Island, some three hours out from Akyab! but there is a Lighthouse there now, and this seems to have scared them, as they no longer breed there.

1503. *STERNA SEENA*.—Indian River Tern.

Rare.

1517. *RHYNCOPS ALBICOLLIS*.—Indian Skimmer.

Fairly common.

ORDER STEGANOPODES.

FAMILY PELICANIDÆ.

1523. *PELECANUS PHILIPPENSIS*.—Spotted-billed Pelican.
Common.

FAMILY PHALACROCORACIDÆ.

1526. *PHALACROCORAX CARBO*.—Large Cormorant.
Common.

1528. *PHALACROCORAX JAVANICUS*.—Little Cormorant.
Very common.

1529. *PLOTUS MELANOGASTER*.—Indian Darter.
Very common.

ORDER HERODIONES.

FAMILY IBIDÆ.

1541. *IBIS MELANOCEPHALA*.—White Ibis.

Extremely common, but appears to be partially migratory, as most of the birds disappear in the breeding season, and I failed to find nests.

1543. *INOCOTIS DAVISONI*.—Davison's Black Ibis.

Not uncommon, and usually found in pairs, but very wary. An excellent bird for the table.

FAMILY PLATELEIDÆ.

1545. *PLATALEA LEUCORODIA*.—Spoonbill.

My first record was a young bird, shot on November 1st, 1908. It was by itself but I subsequently met with several small parties in the same locality both in 1908 and 1909. The place was not far from Akyab, and was the site of an old irrigation tank, now no longer extant, the bund having been destroyed. The birds are probably the remnants of a colony which bred there when the tank contained water.

FAMILY CICONIIDÆ.

1548. *DISSURA EPISCOPUS*.—White Necked Stork.

Common.

1549. *XENORHYNCHUS ASIATICUS*.—Black-necked Stork.

Common.

1550. *LEPTOPTILUS DUBIUS*.—Adjutant.

Common.

1551. *LEPTOPTILUS JAVANICUS*.—Smaller Adjutant.

Rather rare.

1552. *PSEUDOTANTALUS LEUCOCEPHALUS*.—Painted Stork.

Common.

1553. *ANASTOMUS OSCITANS*.—Open-bill.

Not common, but occasionally met with in small parties.

I failed to find the nest of any stork though doubtless they breed in Arakan.

FAMILY ARDEIDÆ.

1554. *ARDEA MANILLENSIS*.—Eastern Purple Heron.

Very common.

1555. *ARDEA CINEREA*.—Common Heron.

Very common.

1556. *ARDEA SUMATRANA*.—Dusky Grey Heron.

Fairly common. Haunts the mangrove swamps and muddy brackish creeks.

1557. *ARDEA INSIGNIS*.—Great White-bellied Heron.
Occasionally met with on the larger jungle streams.
1559. *HERODIAS ALBA*.—Large Egret.
Very common.
1561. *HERODIAS GARZETTA*.—Little Egret.
Very common.
1562. *BUBULCUS COROMANDUS*.—Cattle Egret.
Very common.
1564. *LEPTERODIUS SACER*.—Eastern Reef Heron.
Very common.
1565. *ARDEOLA GRAYI*.—Pond Heron.
Very common.
1568. *NYCTICORAX GRISEUS*.—Night Heron.
Very common.
1572. *ARDETTA CINNAMOMEA*.—Chestnut Bittern.
Very common.
1573. *DUPETOR FLAVICOLLIS*.—Black Bittern.
Very common, generally in nullahs amongst the paddy fields.

ORDER ANSERES.

FAMILY ANATIDÆ.

1584. *SARCIDIORNIS MELANONOTUS*.—Comb Duck.
Common.
1584. *ASARCORNIS SCUTULATUS*.—White-winged Wood Duck.
Occasionally met with in N. Arakan, haunting the larger streams.
1587. *TADORNA CORNUTA*.—Sheldrake.
I obtained one from a party of three on January 31st, 1910, in the Kyaukpyu district. The skin was sent to the Bombay Natural History Society.
1588. *CASARCA RUTILA*.—Brahminy Duck.
Visits Arakan in enormous numbers in the cold weather.
1589. *DENDROCYONA JAVANICA*.—Whistling Teal.
Very common.
1591. *NETTOPUS COROMANDELIANUS*.—Cotton Teal.
Common.
1594. *EUNETTA FALCATA*.—Crested Teal.
A single female, February 1909, Kyaukpyn district.
1597. *NETTIUM GRECCA*.—Common Teal.
Common from October to March.
1599. *MARECA PENELOPE*.—Wigeon.
Obtained two birds from a flock of about 40 on February 1st, 1909, and a single bird in December 1909, Kyaukpyu district.

1600. *DAFILA ACUTA*.—Pintail.

Visits Arakan in enormous numbers from December to March, but as there are few decent jheels, the birds are most often seen in the estuaries of rivers, where they are unapproachable.

1601. *QUERQUEDULA CIRCA*.—Garganey.

There are generally a few garganeys with the common teal, but they are not very plentiful.

1602. *SPATULA CLYPEATA*.—Shoveller.

Rare. I did not see any during the season 1908-09, but shot three during 1909-10.

1607. *NYROCA BAERI*.—Saw about half a dozen altogether, and shot two. In each case the bird was by itself, did not meet with any flocks of *N. ferruginea*, so assume that the single birds which I saw and did not shoot were *N. baeri*.

ORDER PYOPODES.

FAMILY PODICIPEDIDÆ.

1617. *PODICEPS ALBIPENNIS*.—Indian Little Grebe.

Very common.

This completes my list, which numbers 294 species actually identified.

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN
 "THE FAUNA OF BRITISH INDIA."
 SERIES IV, PART V.

BY

SIR GEORGE F. HAMPSON, BART., F.Z.S., F.E.S.

(Continued from page 911 of this Volume).

CATOCALINÆ.

2443a. HOMOPTERA EREMOCHROA, n. sp.

♀. Head, thorax and abdomen pale grey-brown; palpi white, the extremity of 2nd joint and the 3rd joint blackish; pectus, legs and ventral surface of abdomen white, the fore tarsi black ringed with white. Forewing brownish grey irrorated with black, the costa with numerous black striæ with slight whitish streaks between them; subbasal line represented by black points on median nervure and vein 1; antemedial line black, minutely waved and slightly excurved; reniform a minute lunule with traces of a blackish line from it to inner margin; postmedial line indistinctly double, slightly bent outwards below costa and incurved at discal fold, incurved below vein 4 and excurved at vein 1; subterminal line indistinctly double filled in with grey, angled outwards at vein 7 and excurved at middle; a minutely waved black line just before termen with series of black points in the interspaces. Hindwing brownish grey with dark striæ on inner margin; traces of four waved dark lines on terminal half; a lunulate black line just before termen; cilia whitish with a brown line through them; the underside white irrorated with pale brown except on basal and inner areas, a slight discoidal point and waved blackish terminal line.

Habitat.—BOMBAY, Deesa (Nurse). *Exp.* 24 mill. Type in B. M.

2446a. HOMOPTERA RUFICOLORA, n. sp.

♂. Head, thorax and abdomen bright rufous mixed with some ochreous; antennæ blackish; tarsi blackish ringed with whitish. Forewing bright rufous; subbasal line deep rufous, double, waved, from costa to median nervure; antemedial line deep rufous, minutely waved, inwardly oblique; medial line minutely waved, excurved; postmedial line indistinctly double, oblique from costa to vein 6, slightly incurved at discal fold, incurved and minutely waved below vein 4; subterminal line indistinct, brown, excurved below vein 7 and at middle; a terminal series of slight brown striæ. Hindwing greyish white, the veins and terminal area suffused with bright rufous; a postmedial series of minute dark

streaks on the veins and a striga at inner margin with another dark striga before it; a terminal series of slight brown striæ; the underside ochreous white, the costal area slightly irrorated with red-brown.

Habitat.—MADRAS, Gooty (Campbell). *Exp.* 32 mill. Type in B. M.

2526*b*. *HYPÆTRA PULCHERRIMA*, Butl., A. M. N. H., 1892, p. 298.

„ *tepesceus*, Swinh., A. M. N. H. (7) xvi, p. 152 (nec Wlk.).

Head rufous; palpi brown; sides of frons deep brown with fine whitish streaks above; thorax rufous and deep brown; abdomen brown, the dorsal crests rufous. Forewing brown with a violaceous tinge; a black spot on costal area near base finely defined by whitish; a broad deep black antemedial band from costa to just above inner margin, its inner edge defined by a fine whitish line and angled outwards in cell, its outer edge by a whitish band diffused outwardly; a blackish spot on costa above end of cell; an oblique cocked-hat-shaped mark just beyond the cell finely defined by whitish, its upper extremity curved up to below costa and its lower bent inwards to lower angle of cell, its outer edge forming the postmedial line, angled upwards from its lower extremity into cell, then excurved and forming two small black lunules finely defined by white on inner area, a rufous shade beyond it; a small blackish spot below costa towards apex; the terminal area rather darker. Hindwing uniform brown.

Habitat.—ANDAMANS, Port Blair; SINGAPORE; BORNEO; BR. N. GUINEA. *Exp.* 50 mill.

2527*a*. *HYPÆTRA HETEROGRAPHA*, n. sp.

♂. Antennæ bipectinate with moderate branches, the apical part simple; hindwing with fold between veins 6·7 clothed with glossy scales on upper side. Head, thorax and abdomen reddish brown; tarsi pale. Forewing reddish brown suffused with grey except medial part of costal area; subbasal line represented by a small curved black mark from costal with point below it; a large irregularly triangular black antemedial patch from cell to just above inner margin, its apex connected with the costa by a sinuous line with small black spot before it below the costa; a black point in middle of cell; two sinuous red-brown indistinct medial lines, oblique from costa to lower angle of cell, where there is a black point, and with small diffused spot on its inner edge on discocellulars, below the cell incurved to submedian fold, then bent outwards, an oblique black bar beyond it from costa; an irregular obliquely placed cocked-hat-shaped black patch beyond the cell, its upper extremity forming an oblique line to below the costa and its lower curved inwards to below angle of cell, then with bisinuate line to inner margin; subterminal line indistinct, irregularly waved, angled inwards at discal and submedian folds and with oblique black striga on it below costa; the terminal area somewhat redder brown. Hindwing grey brown with glossy scaling between veins 6·7 and slight dark subterminal

marks at veins 2 and 1; the underside greyer with slight brown postmedial striga below vein 2.

Habitat.—BURMA, Tenasserim, Moolayit. *Exp.* 48 mill. Type in B. M. 2490a. OPHIUSA RUBIDA, Wlk., Journ. Linn. Soc. Zool. vii., p. 179 (1864).

Head and tegulæ deep chocolate red; thorax greyish brown; pectus pale rufous; legs fuscous mixed with grey; abdomen fuscous, the extremity and ventral surface pale grey. Forewing deep chocolate red, the medial area with a greyish gloss to median nervure; a terminal whitish band irrorated with brown, bent outwards to apex and narrowing to tornus; a fine dark antemedial line, very oblique from costa to below the cell, then obsolete; a black point in middle of cell; two minute grey discoidal spots defined by chocolate; a slight dark postmedial line very oblique from costa to vein 6, then obsolete; an indistinct diffused waved brown subterminal line; a fine waved line just before termen; a slight dark terminal line; cilia fuscous with series of whitish points at base. Hindwing fuscous black; an oblique bluish white band from middle of costa to above tornus; the termen narrowly whitish from below apex to submedian fold with a waved brown terminal line; cilia white; the underside grey-white, the terminal area suffused with fuscous, broadly at apex, narrowing to tornus.

Habitat.—ASSAM, Khâsis, Jaintias; BORNEO, Sarawak. *Exp.* 76 mill. 2491a. OPHIUSA LACTEICINCTA, n. sp.

♀. Head and tegulæ deep chocolate red; thorax greyish; pectus whitish tinged with rufous; legs grey-brown; abdomen fuscous brown, the extremity grey, the ventral surface whitish tinged with rufous. Forewing grey-brown tinged with chocolate deepening towards the brownish white terminal band which is bent outwards to apex and narrows to tornus; a fine dark subbasal line from costa to submedian fold; ante- and postmedial lines dark-brown, very oblique, the latter slightly curved; a black point in middle of cell; two minute grey discoidal spots defined by brown, a diffused brown subterminal line; a fine waved brown line just before termen; a slight brown terminal line. Hindwing greyish brown, the termen and cilia brownish white from apex to vein 1; the underside brownish white, the terminal area tinged with brown.

Habitat.—ASSAM, Shillong (Rawlings). *Exp.* 76 mill. Type in B. M.

PLUSIANÆ.

2667a. PLUSIA EXQUISITA. Feld. Reis. Nov. pl. 110, f. 30 (1874).

Head and thorax whitish mixed with brown; metathorax with some black scales; tarsi brownish ringed with white; abdomen white slightly tinged with red-brown. Forewing whitish mostly suffused with rufous brown and slightly irrorated and striated with black; a waved white

subbasal line from costa to vein 1 defined by black on inner side; a waved black antemedial line defined by white on inner side and with blue-grey lunules before it in submedian interspace; orbicular pure white, elongate elliptical and conjoined to a large oblique elliptical white spot below the cell; reniform narrow, defined by white and strongly constricted at middle, a black spot above it on costa; postmedial line black, slightly defined by white on outer side, minutely waved below costa, then oblique, somewhat dentate, and angled outwards at vein 3, some blue-grey beyond it between veins 5 and 2; subterminal line black, defined by brown on inner side and white on outer, excurved below costa, angled inwards in discal fold, then somewhat dentate, a fine black terminal line with narrow brown band before it, defined by white striæ on inner side; cilia chequered brown and white. Hindwing bright yellow with broad fuscous terminal band; cilia chequered brown and white.

Habitat.—NATAL; CAPE COLONY; BALUCHISTAN, Quetta. *Exp.* 36 mill.

2677a. *PLUSIA MEGALOPA*, n. sp.

♀. Head fiery red; palpi and antennæ rufous, the latter with the basal joint whitish; thorax rufous, the tegulæ tinged with fiery red and the metathorax with brown; tarsi with slight pale rings; abdomen greyish rufous, the dorsal crests fiery red, the basal crest tipped with black. Forewing rufous with a greyish tinge, the medial area, except towards costa, and the medial part of terminal area suffused with brilliant cupreous red; subbasal line represented by an oblique golden striga from costa defined on each side by some cupreous red; the stigma below the cell silvery white forming a small oblique elliptical spot conjoined to a large conical spot beyond it; orbicular slightly defined by silver, round, open above; reniform with silver bar on inner edge and angled mark on outer; postmedial line slight, silvery defined by brown on inner side, erect, sinuous, some whitish points beyond it on costa; an indistinct irregularly dentate subterminal brown line; cilia grey-brown. Hindwing cupreous brown with a greyish tinge; cilia brown at base, grey at tips.

Habitat.—ASSAM, Khasis (Badgley). *Exp.* 26 mill. Type in B. M.

2681a. *PLUSIA CHALCOPASTA*, n. sp.

Hind tibiæ and 1st joint of tarsi of male fringed with long hair; abdomen with lateral tufts of very long hair.

Head and thorax bronze-brown slightly mixed with greyish, the tegulæ, patagia and metathoracic crests tipped with whitish scales; tarsi slightly ringed with whitish; abdomen red-brown. Forewing purplish grey-brown suffused with golden bronze, the lines golden bronze; subbasal line slight, oblique, from costa to median nervure; antemedial line inwardly oblique, sinuous, a bisinuate striga from it to near postmedial line below the cell, with some purplish grey above it in and below the cell; orbicular and reniform with faint bronze annuli, the former round, the latter oblique elliptical;

postmedial line oblique, slightly incurved below discal fold; subterminal line more golden with some cupreous bronze on its inner side and dark suffusion before it and beyond it at apex, excurved from below costa to vein 6, then oblique; a terminal series of slight golden striæ. Hindwing fuscous brown with a reddish bronze gloss; cilia whitish with a dark line near base; the underside grey irrorated with brown, the terminal half suffused with brown except the termen.

Habitat.—N. INDIA (Walhouse); MADRAS, Gooty (Campbell), Nilgiris (Lindsay, Hampson); CEYLON, Maskeliya (de Mowbray), Pattipola (Green). *Exp.* 42-48 mill. Type in B. M.

Genus OMORPHINA.

Type.

Omorphina, Alph. Hor. Soc. Ent. Ross., XXVI., p. 452 (1892). *aurantiaca*.

Proboscis fully developed; palpi obliquely porrect, slender, the 1st and 2nd joints fringed with long hair in front, the 3rd rather long; frons smooth; eyes small, reniform; antennæ of male ciliated; head and thorax clothed with rough hair only and without crests; tibiæ clothed with long hair; abdomen with some rough hair at base but without crests. Forewing short and broad, the apex rounded, the termen evenly curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 fully developed from above angle; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2688a. OMORPHINA AURANTIACA, Alph. Hor. Soc. Ent. Ross., XXVI., p. 452 (1892); id. Rom. Mém. ix., p. 41, pl. 1 f. 2. Staud. Cat. Lep. pal., p. 220.

Head, thorax and abdomen black clothed with bright rufous hair; palpi and legs with fuscous hair mixed, the anal tuft pale rufous. Forewing bright rufous, the basal half slightly suffused with fuscous; traces of a sinuous dark antemedial line; orbicular and reniform defined by deep rufous, the former round, the latter narrow; a deep rufous postmedial line, slightly bent outwards below costa, then waved, incurved at discal fold and strongly below vein 4; a minutely waved rufous subterminal line; cilia deep rufous. Hindwing bright orange yellow; the base and inner area suffused with black, confluent with the black discoidal lunule; a narrow black terminal band; cilia pale rufous, with dark line near base; the underside with the blackish suffusion confined to inner area.

Habitat.—TIBET; SIKKIM. *Exp.* 24 mill.

NOCTUINÆ.

2300. COSMOPHILA MESOGONA.

Larva. Semi-looper. Grass green with numerous black-centred white

spots; dorsal and lateral stripes dark-green with pale edges. Food plant wild raspberry in the leaves of which it spins up when pupating. (W. H. Campbell).

2303*a*. *COSMOPHILA FIGLINA*, Butl., Ill. Het. B. M. vii., p. 71, pl. 131.

f. 2 (1889).

♂. Forewing with the termen slightly excurved at middle.

Head and thorax rufous tinged with brown; palpi whitish in front; lower part of frons whitish; antennæ with the basal joint whitish in front; pectus and legs yellowish tinged with rufous; abdomen grey-brown, the basal crest rufous tipped with whitish, the anal tuft tipped with white, the ventral surface yellowish tinged with rufous. Forewing yellow mixed with red, the costal area, cell, and the area from lower angle of cell to termen between vein 5 and submedian fold red-brown with a greyish tinge; a whitish mark at base of inner margin; antemedial line blackish, oblique, waved, excurved at median nervure and above inner margin; orbicular and reniform diffused brown, undefined, the former round with a white point in centre, the latter lunulate; postmedial line black, waved, oblique from costa to below vein 7, at vein 3 retracted to lower angle of cell and again excurved below submedian fold; an indistinct waved subterminal line defined on inner side by brown suffusion, incurved between veins 6 and 4 and below vein 3. Hindwing grey-brown; cilia whitish; the underside whitish with the costal half tinged and irrorated with red, a slight waved postmedial line.

♀. Forewing more uniform purplish brown.

Habitat—PUNJAB, Dharmśāla; ASSAM, Khásis; CEYLON, Maskeliya. Madulsima; BURMA, Rangoon. *Exp.* 38 mill.

2318. *CHURIA ARCUATA*, del. *Anomis figlina*.

2441*a*. *POLYDESMIA NODUNA*; Swinh. A.M.N.H. (7), xvi., p. 152 (1905).

♀. Head and thorax dark sap-green mixed with white; pectus and legs pale red-brown, the tarsi fuscous ringed with white; abdomen pale red-brown, the ventral surface whitish. Forewing dark sap-green irrorated with white; a diffused white fascia below base of cell, the medial area whitish from below costa to above submedian fold, the postmedial costal area whitish; subbasal line defined on each side by whitish, excurved below costa and angled inwards in cell; antemedial line defined on inner side by white to submedian fold, slightly incurved from costa to median nervure, angled inwards in submedian fold, then double and excurved above inner margin; a black discoidal lunule; a rather diffused straight medial line interrupted in cell; postmedial line double filled in with white, oblique and minutely waved from costa to vein 6, inwardly oblique to submedian fold, then excurved and angled inwards on vein 1, some white points beyond it on costa; an oblique dentate white line defined by dark scales on inner side from costa near apex to submedian fold, where

there is a wedge-shaped blackish mark beyond it; subterminal line dentate, black defined by white lunules on inner side and connected by slight dark streak with a terminal series of faint striæ; cilia with a fine whitish line at base. Hindwing whitish suffused with glossy ochreous, the veins and terminal area dark-brown; a discoidal lunule, and sinuous post-medial line angled outwards in submedian fold; a subterminal series of white striæ; a white patch at termen and on cilia with a dark patch above it; cilia with a fine pale line at base; the underside whiter irrorated with brown, a black discoidal lunule, sinuous postmedial line, and broad dark terminal band.

Habitat.—CEYLON. *Exp.* 42 mill.

2522a. *ISOURA METAPHLEA*, n. sp.

Palpi with the 3rd joint long.

♀. Head, thorax and abdomen red-brown with a purplish tinge; palpi at base, pectus, legs and ventral surface of abdomen whitish tinged with fulvous, the tarsi fuscous with pale rings. Forewing red-brown with a purplish tinge; subbasal line represented by a small black spot below costa, the antemedial line by a black striga from costa, a spot in cell nearer base, and sometimes a slight striga below submedian fold; orbicular represented by a small black spot, the reniform by black points on its inner and outer edges: a more or less incomplete minutely waved black medial line bent inwards to costa; postmedial line represented by a double series of slight black lunules with another series beyond it, bent inwards to costa, then nearly erect; an incomplete minutely waved black subterminal line slightly excurved below vein 7. Hindwing with the basal area brownish ochreous, the rest of wing fuscous brown with a diffused brownish ochreous post-medial band not reaching costa or inner margin; cilia paler; the underside ochreous white with blackish postmedial band from below costa, where it is angled outwards, to submedian fold; the terminal area suffused with fuscous.

Habitat.—CEYLON, Colombo (Mackwood), Kandy (Green). *Exp.* 44 mill. Type in B. M.

2543b. *BOCULA SINIFERA*, n. sp.

♀. Head and thorax red-brown; legs suffused with fuscous; abdomen fuscous brown, the ventral surface whitish suffused with red-brown. Forewing red-brown tinged with fuscous; two indistinct diffused incurved medial lines: a slight pale discoidal spot with minute brown lunule on it: an indistinct pale incurved postmedial line; a pale subterminal line, oblique from costa just before apex to vein 7, then excurved, then strongly bent inwards between veins 6 and 4 and excurved to inner margin near tornus, defined by black on outer side from costa to vein 4, strongly in the sinus: a terminal series of slight pale points: cilia greyish at tips. Hindwing fuscous brown, the cilia greyish: the underside greyish suffused and

irrorated with brown, a slight discoidal lunule and indistinct diffused curved postmedial line.

Habitat.—ASSAM, Khâsis. *Exp.* 40 mill. Type in B. M.

2544 *b.* *BOCULA MACOMA*, Swinh., A. M. N. H. (7) xviii., p. 410 (1906).

♂. Head and thorax pale rufous slightly irrorated with fuscous; palpi fuscous; forelegs and the tarsi fuscous; abdomen greyish dorsally suffused with fuscous. Forewing pale rufous slightly irrorated with fuscous; a black point on median nervure at origin of vein 2; traces of a very oblique sinuous medial line; postmedial line represented by a very oblique series of minute dark points on the veins; an oblique sinuous fuscous fascia from apex to vein 5 just beyond the postmedial line with a straight black line diffused on outer side from its extremity to inner margin near tornus, the area beyond it tinged with fuscous to the indistinct diffused sinuous subterminal line; a terminal series of small black lunules. Hindwing pale brown suffused with fuscous; the underside grey irrorated with brown. the terminal area suffused with fuscous to vein 2. a slight discoidal lunule and indistinct diffused curved postmedial line.

Habitat.—ASSAM, Khâsis. *Exp.* 28 Mill.

2555. *ACANTHOLIPES HYPENOIDES* insert (Syn.) *Rivula magniplaga*.

Swinh., A. M. N. H. (7) xvi., p.

622 (1900).

Genus MASCA.

Type.

Masca, Wlk., xvi., 8 (1858) *abactalis*.

Phagytra, Wlk., xxxiv., 1508 (1865) *abactalis*.

Probosis fully developed; palpi obliquely upturned, the 2nd joint reaching to about vertex of head and moderately scaled, the 3rd moderate: frons smooth; eyes large, rounded; antennæ of male ciliated; head and thorax clothed with hair and scales and without crests; fore femora and tibiæ of male broadly fringed with hair. the 1st joint of tarsus with tuft of hair; mid tibiæ broadly fringed with hair; hind tibiæ broadly fringed on both sides with hair and with tuft of very long hair from base: abdomen without crests. Forewing with the apex rectangular, the termen slightly angled at vein 4; veins 3 and 5 from near angle of cell; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 from above angle: 6·7 from upper angle; 8 anastomosing with the cell near base only.

2616a. *MASCA ABACTALIS*, Wlk., xvi., 9 (1858).

Phagytra leucogastralis, Wlk., xxxiv., 1508 (1865).

Metria platypoda, Feld., Reis. Nov., pl. 120, f. 44 (1873).

Head and thorax white mixed with reddish-brown; antennæ ringed brown and white: hindlegs with the tufts of hair black at tips; abdomen

white with lateral brownish streaks. Forewing with the basal half white tinged and irrorated with brown; the terminal half suffused with fuscous brown; traces of an oblique antemedial line with more prominent spots below the cell and above inner margin; an obscure very oblique dark spot in middle of cell and discoidal spot constricted at middle; the dark terminal area angled inwards below the cell; a minutely dentate postmedial line bent outwards below costa, oblique below vein 4, and angled inwards in submedian fold; two subterminal white points near apex and traces of a subterminal line; a terminal series of dark striæ. Hindwing white, the terminal half of costal area broadly fuscous, on terminal area extending to vein 3; a postmedial series of minute black streaks on veins 5 to 1; a terminal series of black striæ; the underside thickly irrorated with fuscous brown except inner area and terminal area below vein 5, a black discoidal point, curved diffused medial brown band and double postmedial series of brown points.

Habitat.—ASSAM, Khásis; SINGAPORE; BORNEO; PHILIPPINES; JAVA: AMBOINA; CERAM; NEW GUINEA. *Exp.* 46 mill.

2747a. EGNASIA MESOTYPA, Swinh., A.M.N.H. (7), xvii., p. 550 (1906).

Head, thorax and abdomen dull reddish brown; palpi irrorated with fuscous, the tuft on 3rd joint black; pectus and ventral surface of abdomen greyish irrorated with fuscous. Forewing dull reddish brown tinged with grey and irrorated with fuscous; a dark oblique antemedial line, incurved in cell; a small round white spot in middle of cell defined by fuscous; an inverted comma-shaped discoidal whitish mark defined by fuscous and with reddish spot in lower part; a dark postmedial line oblique from costa to vein 6, then minutely waved, oblique below vein 5 and with traces of another line beyond it; a curved dentate subterminal line; a fine black terminal line; cilia brown at base, whitish at tips except at middle. Hindwing dull reddish brown tinged with grey and irrorated with fuscous; a whitish discoidal mark defined by black, its outer edge twice indented and with small round spot beyond its lower extremity; a dark slightly sinuous medial line; a dentate subterminal line; a fine black terminal line; cilia brown at base, whitish at tips, intersected by brown at the points; the underside paler with indistinct diffused line beyond the medial line.

Habitat.—ASSAM, Khásis. *Exp.* ♂ 24, ♀ 30 mill.

2748a. EGNASIA TENELLA, n. sp.

♂. Head, thorax and the abdomen creamy white, back of head with two brown points, the thorax slightly irrorated with brown, the abdomen faintly tinged with brown; palpi with the extremity of 2nd joint and the 3rd joint ringed with brown; tarsi brownish ringed with white. Forewing creamy white slightly irrorated and striated with brown; a curved subbasal brown striga from costa; antemedial line brown, waved: the discocellulars with

two brown strizæ and two blackish points; a faint medial line excurved to discocellulars; postmedial line brown, excurved from costa to vein 4, then slightly incurved; two minute dark streaks on costa towards apex and traces of a minutely waved white subterminal line with series of blackish points on its outer edge; a fine brown terminal line; cilia tinged with rufous. Hindwing creamy white slightly irrorated with brown; a black discoidal point enclosed by the faint medial line which forms an elliptical annulus round it; a curved brown postmedial line; subterminal line represented by a double series of small brown spots except towards costa, with whitish points between them; a fine brown terminal line; cilia tinged with rufous.

Habitat.—BURMA, Maymyo. *Exp.* 26 mill. Type in B. M.

2762a. CAPNODES SUBAPICALIS, Swinh., A.M.N.H. (7), xvi., p. 154.

(1905).

♀. Head and thorax fuscous irrorated with white, tibiæ and tarsi pale rufous; abdomen pale rufous dorsally irrorated with fuscous and whitish. Forewing pale rufous irrorated with a few black scales; a blackish patch at base of costa; a black point in middle of cell; an indistinct medial line, strongly incurved below the cell; two black discoidal points edged with whitish; an indistinct dentate rufous postmedial line, oblique towards costa and strongly incurved below vein 4; traces of a waved subterminal line towards tornus; a semicircular brown line from below costa towards apex to termen at vein 5, defined by white on outer side, and connected by diffused fuscous streaks with small subterminal black spots defined by white, below this semicircular patch is a series of black points before termen; a fine black terminal line; cilia marked with fuscous towards apex and with fine black line near tips. Hindwing pale rufous irrorated with a few black scales; two obliquely placed black discoidal points; a minutely waved rufous line from below middle of costa to tornus with a black spot beyond it at tornus; a series of black points just before termen; a fine dark terminal line; the underside yellowish white irrorated with rufous, two discoidal black points, a curved dentate rufous postmedial line, and series of black points just before termen.

Habitat.—ASSAM, Silchar; CACHAR. *Exp.* 36 mill.

2772. RAPARNA DIGRAMMA.

Larva.—Fuscous thickly spotted with pale green; intersegmental olive-green bands; an olive-green dorsal stripe with spots on it; an interrupted subspiracular pale green line; the 12th somite somewhat swollen, with an orange band; ventral surface dull green; head flat, bright red; four pairs of prolegs. Food plant. *Ochna squarrosa*, 5. (W. H. Campbell.)

HYPENINÆ.

28196. BLEPTINA HETEROPALPIA, n. sp.

Antennæ of male minutely serrate and with fascicles of long cilia, some-

what contorted and fringed with scales above at middle; palpi with the 3rd joint long, from outer extremity of 2nd, oblique, bent forward at extremity, fringed with long hair behind and short scales in front; fore tibia without sheath; forewing with large costal fold on underside.

♂. Head and thorax fuscous brown mixed with grey; tarsi with slight pale rings; abdomen grey suffused with fuscous brown. Forewing grey tinged with brown and irrorated with black; an indistinct sinuous black antemedial line; a diffused black medial shade not extending to costa; reniform whitish with brown centre, elliptical; postmedial line diffused, blackish, incurved below end of cell; subterminal line indistinct, whitish defined on inner side by blackish suffusion, angled outwards at vein 7 and with blackish patch before it, excurved at middle; a terminal series of black points. Hindwing whitish tinged with brown, traces of a diffused antemedial line and curved postmedial and subterminal lines; a terminal series of black striæ; the underside whitish irrorated with brown, a black discoidal lunule, the postmedial and subterminal lines more distinct.

Habitat.—MADRAS, Palnis (Campbell). *Exp.* 28 mill. Type in B. M.

2828. BLEPTINA TRIANGULIFERA insert (Syn), *Maena pratextata*, Hering Stett. Ent. Zeit. xlv., p. 98, pl. 1, f. 1 (1903).

2833b. MASTIGOPHORUS INDENTIFASCIA. Swinh., A. M. N. H. (7) xvii., p. 283 (1906).

Fuscous brown; palpi with the tuft of hair on inner side ochreous; tarsi ringed with whitish. Forewing with the area to postmedial line greyish fuscous; antemedial line represented by slight dark suffusion; a small deep black spot in middle of cell and rather large deep black discoidal lunule; postmedial line fuscous defined by greyish on outer side, excurved from costa to vein 4, then incurved and minutely waved, subterminal line grey, angled inwards at discal fold and incurved in submedian interspace; a terminal series of slight black lunules. Hindwing with small blackish discoidal spot, postmedial line fuscous defined by grey on outer side, minutely waved, excurved at middle; subterminal line greyish, obsolete towards costa, excurved from vein 6 to 3, then incurved; a terminal series of black striæ; the underside grey irrorated with fuscous, the terminal area suffused with brown, a black discoidal spot, curved minutely waved medial line and pale curved subterminal line defined on each side by fuscous.

Habitat.—BHUTAN; ASSAM, Khâsis. *Exp.* 40 mill.

Under MASTIGOPHORUS insert *Oxanemus*, Swinh. Cat. Het. Mus. Oxon, ii. p. 201 (1900) for Sect. ii. Type *brontesalis*.

2838a. MASTIGOPHORUS MAGNIPLAGA, Swinh., A. M. N. H. (7) xvi, p. 624 (1905).

♂. Red brown. Forewing with black point at base of costa and subbasal point below the cell, an indistinct pale antemedial line slightly bent inwards to costa, with black point before it in cell and spot beyond it on costa : a large rounded black discoidal patch truncate above and defined by ochreous, with dark brown patch above in on costa and slight oblique pale band beyond it touching its outer edge ; postmedial line very indistinct. dark, minutely crenulate, excurved from costa to vein 4, then oblique, a diffused dark patch beyond it on costa ; a terminal series of black points. Hindwing with indistinct diffused pale postmedial band with the slight curved brown postmedial line on it ; a slight dark terminal line ; the underside greyish brown with small black discoidal spot, minutely crenulate postmedial line, and indistinct minutely crenulate subterminal line.

Habitat.—SIKIM ; ASSAM, Khásis. *Exp.* 42 mill.

2868b. *NODANA DISCOSTICTA*, n. sp.

Antennae of male knotted and contorted at middle ; fore tibia with the sheath covering the basal joint of tarsus only, fore and hind legs with a large tuft of hair from femero-tibial joint.

♂. Head, thorax and abdomen ochreous brown tinged with purplish grey ; legs with the tufts ochreous. Forewing brown mixed with purplish grey and with slight dark irroration, the costal edge darker ; subbasal line blackish, from costa to median nervure ; antemedial line black, minutely waved, bent inwards to costa : a round black discoidal spot ; postmedial line black, minutely dentate, excurved from costa to vein 4, then incurved, subterminal line whitish, defined on each side by fuscous, almost straight ; a terminal series of black points ; cilia with a fine pale line at base. Hind wing grey suffused with brown ; an indistinct discoidal bar and straight postmedial line from vein 6 to inner margin ; subterminal line whitish defined on inner side by fuscous, the white not extending to costa, almost straight from costa to submedian fold where it is angled ; a terminal series of black points ; cilia with a pale line at base ; the underside whitish irrorated with brown, a black discoidal lunule, the postmedial line slightly angled outwards at vein 6 and inwards at discal fold, the subterminal line diffused and slightly angled at veins 5 and 2.

♀. Rather deeper ochreous brown.

Habitat.—CEYLON, Kandy (Green), Peradeniya (Green). *Exp.* 34 mill. Type in B. M.

Genus *PILIPECTUS*.

Type.

Pilipectus, Beth-Bakn. A. M. N. H. (8) vi., p. 443 (1910) *ocellata*.

Proboscis fully developed ; palpi upturned, the second joint reaching to about vertex of head and moderately fringed with hair in front, the 3rd long and slender ; fronts smooth, with tuft of hair ; eyes large, round ;

antennæ of male ciliated; thorax clothed with scales mixed with long hair, the tips of patagia with very long hair, without crests; mid tibiæ moderately fringed with hair, the hind tibiæ fringed on both sides with long hair, the inner spurs very long; abdomen with some long hair at base and crest on basal segment. Forewing with the apex rounded, the termen rather oblique below vein 4, not crenulate, the inner margin with numerous scale-teeth of scales and long hair; vein 3 from before angle of cell; 5 from above angle; 6 from just below upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Hindwing with veins 3·4 from angle of cell; 5 fully developed from just above angle; 6·7 from upper angle; 8 anastomosing with the cell near base only.

2874b. *PILIPECTUS CYCLOPIS*, n. sp.

♂. Head and thorax ochreous white tinged with rufous and mixed with chocolate-brown scales; pectus and legs white, the latter suffused with brown; abdomen white dorsally tinged with brown, the crest at base brown. Forewing covered with fine chocolate-brown and white striæ and with numerous coarser white striæ, the basal half with the dark markings blackish; the veins whitish, antimedial chocolate-red marks above and below vein 1; a chocolate-red patch suffused with plum-colour beyond the cell, an orange spot on its lower part with white point above it, divided by whitish striæ from a semicircular chocolate-red patch defined by whitish beyond it, its middle part suffused with plum-colour and with some white in centre, two fine dark streaks above it below costa; the apex pale rufous without striæ: the termen with blackish marks irrorated and striated with white, the three towards apex small triangular spots, a large triangular patch at vein 5, wedge-shaped patch below vein 3, and rounded patch above tornus. Hindwing white, the apical area suffused with brown. Underside of forewing brown, the tornal area white.

♀. Hindwing almost wholly suffused with brown, the cilia white slightly tinged with brown.

Habitat.—CEYLON, Haldamulla (Mackwood), Matale (Pole); SINGAPORE: BORNEO, Sarawak. *Exp.* 44 mill.

No. 1497. *Caecyparis pruniifera*, Swinh. from Sikhim belongs to this genus, the forewing has the outer part of the postmedial patch extending from just below costa to below vein 3 and with yellow marks on it in the interspaces except between veins 6 and 5; *P. ocellata*, B.-Baker. from New Guinea has the fuscous on termen of hindwing in male extending to tornus.

1407j. *TOLPIA ARGENTESCENS*, n. sp.

Head, thorax and abdomen brownish ochreous with a slight silvery gloss; palpi blackish except at tips; tarsi blackish ringed with white. Forewings ochreous with a slight silvery gloss irrorated with rufous, the terminal area suffused with rufous, the costa dark-brown to middle where it expands into a patch; subbasal line represented by a black striga from costa and a point

in cell; antemedial line brown, oblique from costa to a small black spot in middle of cell, then erect, waved; medial line brown with small black spot on costa, erect, sinuous, with a small white discoidal spot on its outer edge; postmedial line red-brown defined on outer side by whitish, oblique to vein 6, slightly incurved at discal fold, then excurved, incurved below vein 4; subterminal line whitish defined on inner side by red-brown, excurved below vein 7 and at middle; some black striæ on costa towards apex and on termen. Hindwing ochreous white tinged with brown; a fine brown terminal line; the underside with the costal area suffused with brown, a blackish discoidal striga.

Habitat.—CEYLON, Kandy (Green). *Exp.* 14 mill. Type in B. M.

2904c. MARAFANA CAUTIPERAS, n. sp.

Head and thorax white mixed with grey-brown; palpi with the 2nd joint red-brown at sides, the 3rd with fuscous ring near tips; frons red-brown at sides; forelegs fuscous in front; abdomen white dorsally suffused with rufous except at base, the basal crest red-brown. Forewing white tinged with rufous, the costal area suffused with brown towards base; a large quadrate patch of red-brown mixed with fiery red and grey on terminal part of costal area, extending down to vein 4 and on inner part to vein 3; subbasal line white, excurved below costa and ending at submedian fold; antemedial line white slightly defined on inner side by rufous, angled outwards at subcostal and median nervures, then oblique; traces of a waved brown medial line; postmedial line white, very oblique and sinuous to vein 4, then inwardly oblique, some white points beyond it on costa; subterminal line white with diffused white patch before it at costa and defined on outer side by brown on the dark area, angled outwards at veins 7 and 4 and slightly incurved at submedian fold, where there is a rufous point on its outer edge; a series of black points just before termen; a fine black terminal line. Hindwing whitish suffused with brown; a dark discoidal point; a whitish postmedial line; traces of a sinuous punctiform subterminal line, a series of black points just before termen and a fine black terminal line; cilia pure white; the underside white irrorated with fuscous, a black discoidal spot, indistinct rufous postmedial line, faint punctiform subterminal line, and series of black points before termen.

Habitat.—CEYLON, Kandy (Mackwood); SINGAPORE (Ridley). ♀. *Exp.* 34 mill. Type in B. M.

2904d. MARAFANA DIPLOGRAMMA, n. sp.

♂. Head and tegulæ red-brown slightly tinged with grey; thorax and abdomen grey-brown. Forewing grey-brown suffused with reddish brown on basal costal area, beyond the antemedial line, on postmedial area except towards inner margin, and on terminal area; subbasal line pale, inwardly oblique, from costa to submedian fold; antemedial line double filled in with whitish, erect, slightly incurved in cell; a double discoidal

bar filled in with whitish; postmedial line double filled in with whitish, oblique below vein 4; an oblique grey-white shade from costa before the subterminal line which is indistinctly double filled in with whitish, slightly incurved at discal fold, excurved at middle, and incurved below vein 4. Hindwing grey suffused with fuscous brown; an indistinct postmedial line; cilia pale rufous; the underside whitish irrorated with reddish brown, a dark discoidal lunule, somewhat diffused sinuous postmedial line, and series of points just before termen.

Habitat.—CEYLON, Ambalangoda (Pole). *Exp.* 22 mill. Type in B. M. 2915*b*. RHYNCHINA LEUCOGONIA, n. sp.

♀. Head and thorax brown mixed with grey-white, the metathoracic crest tipped with black; abdomen whitish suffused with brown, the basal crest tipped with black; pectus and ventral surface of abdomen white irrorated with brown. Forewing whitish tinged with purple and suffused with brown and irrorated with black; a diffused whitish fascia above vein 1 to postmedial line where it is met by an oblique whitish band from apex; antemedial line very indistinct, excurved below costa, then oblique and angled inwards on vein 1; a white point at lower angle of cell; postmedial line indistinct, double, angled outwards below costa, then very oblique, some white points beyond it on costa; subterminal line slight, dark, dentate with black streaks, before it below veins 7, 6, defined by whitish on inner side below vein 5, with a slight black mark at submedian fold, then with a pure white lunule before it; a terminal series of black points; cilia with slight white lunules in the crenulations. Hindwing reddish brown; the underside whitish tinged with red-brown, a slight discoidal lunule and indistinct curved postmedial line.

Habitat.—MADRAS, Horsleykonda (Campbell). *Exp.* 34 mill. Type in B.M. 2928*b*. HYPENA THERMOPHLEA, n. sp.

♂. Head and thorax dark red-brown; palpi whitish at base and as tip of 3rd joint; pectus and base of legs whitish; tarsi fuscous ringed with whitish; abdomen grey-brown tinged with rufous, the basal crest tipped with grey, the ventral surface whitish. Forewing dark red-brown irrorated with black; an indistinct waved rufous antemedial line defined by ochreous on inner side; obscure blackish spots at middle of cell and on discocellulars; postmedial line rufous slightly defined by ochreous on outer side, minutely waved, oblique from costa to vein 4, then incurved; a subterminal series of slight black points, and a terminal series. Hindwing uniform reddish brown with a cupreous gloss; the underside with the inner half greyish.

Habitat.—BOMBAY, Ratnagiri (Jayakar). *Exp.* 30 mill. Type in B. M. 2929*a*. HYPENA MESOGRAMMA, n. sp.

♀. Head and thorax black-brown mixed with grey; palpi whitish below; antennae ringed with whitish; pectus whitish; tarsi fuscous ringed

with white; abdomen black-brown mixed with grey and with whitish segmental lines, the crests blackish, the ventral surface whitish. Forewing reddish brown mixed with some grey and thickly irrorated with black, the terminal area darker; points of raised black scales with whitish scales in centre at middle of cell and on discocellulars; the postmedial line almost medial, oblique, whitish, defined on inner side by rufous, then by some black scales, some grey points beyond it on costa; subterminal line indistinct, oblique and blackish from costa to vein 6 where it is met by an oblique black streak from apex, then greyish, slightly incurved at discal fold and strongly at submedian fold, a terminal series of black striæ. Hindwing fuscous brown with a greyish tinge; a terminal series of black striæ; cilia whitish at tips; the underside whitish irrorated with red-brown, a blackish discoidal point and terminal series of minute black lunules.

Habitat.—MADRAS, Gooty (Campbell). *Exp.* 16 mill. Type in B. M.

2985*b*. *HYPENA MOLYBDOTA*, n. sp.

♂. Head and thorax glossy black-brown; abdomen pale brown; palpi white at tips; tarsi ringed with white. Forewing black-brown with a leaden gloss and irrorated with a few white scales; antemedial line black from median nervure to inner margin, waved; a minute rufous spot defined by black in upper part of middle of cell, reniform small, triangular, rufous defined by black; a waved medial shade from lower angle of cell to inner margin; postmedial line black, minutely waved, excurved below costa and at middle, angled inwards at discal fold, incurved below vein 3 and excurved above inner margin, subterminal line white, minutely waved slightly excurved below vein 7 and at middle; a terminal series of minute black lunules defined on inner side by white scales. Hindwing fuscous; a slight waved black postmedial line on inner area; subterminal line whitish, incurved at vein 2; a terminal series of black points; the underside whitish thickly irrorated with fuscous brown, a small discoidal spot, indistinct dark waved postmedial line, and waved whitish subterminal line defined on outer side by fuscous.

Habitat.—MADRAS, Palnis (Campbell); TRAVANCORE, Pirmád (Mrs. Imray). *Exp.* 30 mill. Type in B. M.

2985*b*. *HYPENA ATRIARENA*, n. sp.

♀. Head, thorax and abdomen reddish brown tinged with grey; palpi black-brown, white at tips; sides of frons black-brown; forelegs tinged with fuscous. Forewing grey suffused with reddish brown; antemedial line indistinct, dark, oblique, waved; a whitish point in middle of cell; reniform black defined by some whitish scales, attenuated above and rounded below; postmedial line slight, dark, minutely dentate, slightly bent outwards below costa and incurved at discal fold and below vein 4; subterminal line indistinct, pale, minutely waved, excurved below vein 7

and at middle ; a terminal series of black striæ. Hindwing grey suffused with brown ; traces of antemedial and medial lines ; a terminal series of dark striæ ; the underside with slight dark discoidal bar and traces of waved postmedial and subterminal lines.

Habitat.—CEYLON, Wellawaya (Green). *Exp.* 22 mill. Type in B. M.

2988a. *HYPENA ABNORMALIS*, n. sp.

Palpi of male with tuft of ochreous hair from 1st joint in front, the 2nd joint with tuft of long hair from base above, curved forward before the fringe of hair ; antennæ serrate and fasciculate ; the cell with fold on underside containing a tuft of long yellow hair ; the fore coxæ and femora with tufts of hair, the fore tibia with small streak covering the base of tarsi.

♂. Head and thorax fuscous brown ; abdomen whitish tinged with brown. Forewing grey suffused with reddish brown and irrorated with fuscous ; traces of an erect dark antemedial line ; postmedial line dark, excurved below costa and at middle and incurved at discal fold and below vein 4 ; faint traces of a dark subterminal line, angled outwards at vein 7 ; a terminal series of black points. Hindwing white faintly tinged with brown except the costal area to beyond middle, the inner area strongly tinged with brown ; the underside white slightly irrorated with brown, a dark discoidal point and terminal line from apex to vein 2.

Habitat.—CEYLON, Hatigala (Green). *Exp.* 28 mill. Type in B. M.

2990. *BRITHA BIGUTTATA* insert (syn.) *Hypena colabalis*, Feld., Reis. Nov., pl. 120, f. 29 (1874).

2996b. *CHUSARIS RUBRIRENA*, n. sp.

♀. Head, thorax and abdomen rufous mixed with some ochreous white ; palpi with some black on outer side of 2nd joint at base and extremity, the 3rd joint white with black ring near extremity ; tarsi banded with black. Forewing ochreous suffused with rufous and irrorated with brown especially on costal area ; a brown antemedial mark on costa with traces of the antemedial line arising from it, oblique, sinuous ; reniform oblique, with red centre defined by black except above and whitish bar before it, some dark suffusion beyond it and a blackish striga above it from costa ; postmedial line white and oblique from costa to vein 6, then obsolescent, strongly angled inwards in submedian fold, a blackish patch beyond it on costa ; subterminal line white slightly defined on inner side by red suffusion, angled inwards below costa and at discal fold, the area beyond it suffused with red and with slight diffused black streaks from below costa to vein 4 ; a terminal series of small black spots defined on inner side by white lunules ; cilia white with some black at apex and middle and black line through them between those points. Hindwing blood-red, the terminal area tinged with brown ; a slight dark discoidal point, indistinct curved white postmedial line with slight oblique black striga before it at inner margin, and subterminal series of slight dark spots towards tornus

with oblique black striga on a white mark before them above inner margin; a series of blackish points just before termen; cilia whitish with blackish line near tips from apex to discal fold; the underside whitish suffused with rufous, traces of waved red medial and postmedial lines, and of a waved white subterminal line defined on inner side by brown and on outer side towards costa, a terminal series of black lunules.

Habitat.—CEYLON, Kegalle (Alston). *Exp.* 18 mill. Type in B. M.

3008b. *HYPENAGONIA FLAVISIGNA*, n. sp.

Palpi projecting about one and a half times length of head.

♀. Head, thorax and abdomen dark-brown mixed with grey; palpi with oblique pale band on 2nd joint. Forewing dark-brown mixed with grey; a slight dark subbasal line, angled outwards below costa, then oblique; a slight dark antemedial line, obliquely excurved from costa to median nervure, then oblique; an oblique diffused medial black band from upper angle of cell to inner margin; a minute whitish discoidal lunule; postmedial line indistinct and whitish on costal half, yellowish on inner half, bent outwards below costa and incurved below vein 4, a irregular yellow mark with slight black marks on its edges beyond it between veins 6 and 4, and some white points on costa; a subterminal series of small triangular black spots with white strigæ on their inner side; cilia mixed with white at tips. Hindwing grey and yellowish thickly irrorated with dark-brown; a black medial band from upper angle of cell to inner margin; a maculate black postmedial line with some yellow before it; an indistinct blackish subterminal line; a series of black strigæ slightly defined on inner side by grey just before termen; a fine black terminal line; cilia mixed with white at tips; the underside white mixed with some yellow and thickly irrorated with black, a small black discoidal spot, medial and postmedial lines, and diffused subterminal shade.

Habitat.—CEYLON, Kalutava (Alston). *Exp.* 16 mill. Type in B. M.

3008c. *HYPENAGONIA LONGIPALPIS*, n. sp.

Palpi projecting about three times length of head, the 3rd joint upturned and tufted with hair at middle.

Head, thorax and abdomen yellowish mixed with rufous and a few black scales; palpi with oblique black line near extremity of 2nd joint, the 3rd joint with black band at middle; tegulæ with some black at tips; tarsi ringed with black. Forewing yellowish mixed with rufous and irrorated with black; a slight waved black subbasal line from costa to median nervure; a fine minutely waved black antemedial line; a brown medial band edged by slight dark lines, the outer edge slightly angled outwards at lower angle of cell below the minute white discoidal lunule; postmedial line fine, black defined on outer side by white, oblique from costa to vein 6, slightly angled inwards at discal fold, incurved and minutely waved below vein 4, the costa beyond it with alternating black and whitish

streaks; the postmedial area with curved series of black points and in female a rounded spot in discal fold with diffused streak from its outer edge to tips of cilia; a subterminal series of small black spots, excurved at middle; a fine waved black terminal line; cilia with whitish line at base of cilia. Hindwing yellowish and white mixed with rufous and irrorated with black; a brown medial band from below costa to inner margin, edged by blackish lines; a postmedial series of black points with minute yellowish lunules on their outer sides; a subterminal series of small black spots defined on inner side by whitish; a fine waved black terminal line; cilia with a whitish line at base and black line at middle; the underside with waved black medial, postmedial and subterminal lines, black discoidal bar, and series of small spots before termen.

Habitat.—CEYLON, Puttalam (Mackwood), Haputale (Alston). *Exp.* 18 mill. Type in B. M.

3008b. *HYPENAGONIA BRACHYPALPIA*, n. sp.

Palpi projecting about the length of head.

♀. Head, thorax and abdomen white; palpi and hinder part of thorax tinged with rufous; fore femora and tibiae tinged with fuscous; abdomen with rufous band at base and slight fuscous bands towards extremity. Forewing white tinged with rufous except on costal area; antemedial line with black point at costa, then slight, rufous, incurved in cell and excurved in submedian interspace; two black discoidal points; a rather diffused oblique rufous line from lower angle of cell to inner margin; postmedial line fine, brown, with black point at costa, strongly bent outwards below costa, then oblique, slightly incurved at discal fold and somewhat sinuous below vein 4; two slight black streaks on costa towards apex; subterminal line slight, whitish, slightly angled inwards below costa and with rufous mark on its outer edge at middle; a terminal series of black striæ with small rather dentate white marks before them; cilia with fuscous spot at middle. Hindwing white; a diffused rufous antemedial line except on costal area; a black discoidal spot; the medial area with some fuscous irroration; an inwardly oblique dark line from costa towards apex to discal fold; a double very minutely waved subterminal line, the inner line blackish, the outer brown and rather diffused towards apex; a fine black subterminal line except at apex; the underside white slightly irrorated with fuscous, a black discoidal point and slight sinuous postmedial line.

Habitat.—CEYLON, Labugama (Mackwood). *Exp.* 14 mill. Type in B. M.

3014z. *MEGISTOPTERA ALBISIGNA*, n. sp.

♂. Head and tegulae brownish white, the palpi brown irrorated with black, the frons with brown lateral bars, some brown between antennæ and two black points at back of head, the tegulae black at middle and tips; thorax and abdomen grey-brown irrorated with a few black scales. Forewing grey-brown irrorated with a few black scales; traces of a strongly

excurred antemedial line; orbicular near end of cell, round, defined by black except below; a comet-shaped mark at end of cell, its upper extremity extending to near costa and its lower to near postmedial line above vein 3, defined by black except above, a white spot on its inner side on discocellulars, a white line on its outer edge and some rufous in centre, some black suffusion beyond it and a slight white streak above its upper extremity; postmedial line black, dentate, oblique from costa near apex to vein 3, angled outwards at vein 7 and inwards at discal fold, a fuscous mark below vein 2; some white points on costa towards apex; subterminal line slight, grey defined on inner side by black striæ, excurred at middle, and angled inwards at discal and submedian folds; a fine waved black terminal line with an ochreous white mark before it below vein 3 and black-brown spot below 2. Hindwing fuscous brown. the cilia whitish; the underside grey thickly irrorated with brown, a slight dark discoidal striga and indistinct pale curved postmedial line.

Habitat.—MADRAS, Horsleykonda (Campbell). *Exp.* 24 mill. Type in B. M.

2103*a*. RIVULA COGNATA, n. sp.

Mid and hind tibiæ of male fringed with long hair on outer side, the mid tibia with fold containing a tuft of long hair; abdomen with lateral tufts of hair near base meeting ventrally; hindwing with the termen deeply excised at submedian fold, the tornus lobed, the inner area with a fold containing a tuft of black scales on upperside just beyond middle.

♂. Head and thorax red-brown, the patagia ochreous white; pectus and legs ochreous white; abdomen dark-brown mixed with some grey. Forewing ochreous white irrorated with dark-brown, the terminal area suffused with red-brown, the costa dark-brown; subbasal line represented by a whitish striga from costa; antemedial line whitish, angled inwards in cell, then with a large patch of black-brown suffusion before it; a whitish discoidal point on a diffused brown spot; postmedial line whitish slightly defined on inner side by brown, bent outwards below costa near apex, then minutely waved, oblique and incurved below vein 4, some oblique white striæ beyond it from costa; subterminal line represented by a small wedge-shaped whitish mark from costa with black point at its apex, then by a series of black points with whitish points on their inner side and by a whitish striga at tornus. Hindwing fuscous brown; a slight whitish line at base of cilia; the underside ochreous white irrorated with brown, a slight dark discoidal spot and indistinct postmedial line from costa to vein 4.

♀. Thorax and ground colour of forewing uniform red-brown.

Habitat.—BOMBAY, N. Kanara, Karwar (Bell); CEYLON, Kandy (Green). *Exp.* 18 mill. Type in B. M.

The structure of *R. basalis* is similar, but the postmedial line of forewing is straight from below apex to inner margin.

2103*b*. *RIVULA SIMULATRIX*, n. sp.

Structure of male similar to *R. basalis* and *cognata*, but abdomen and hindwing normal.

♂. Head, thorax and abdomen pale ochreous yellow. Forewing pale ochreous yellow, the terminal area tinged with rufous; antemedial line whitish defined on outer side by a fine brown line and on inner by rufous suffusion except at costa, excurved from costa to submedian fold, then oblique; a whitish point at upper angle of cell on a diffused rufous spot; postmedial line whitish slightly defined on each side by brown, strongly bent outwards below costa, then oblique, straight, some oblique whitish striæ beyond it from costa; subterminal line represented by a whitish striga from costa, then by a series of black points with whitish points on their inner side and a whitish striga at tornus. Hindwing ochreous white tinged with brown especially on terminal area, a fine dark terminal line; the underside ochreous white irrorated with red-brown.

♀. Head, thorax and abdomen red-brown; forewing entirely suffused with red-brown, with deep red-brown suffusion before antemedial line; hindwing dark red-brown, the cilia rufous.

Habitat.—CEYLON, Dickoya (Green), Pundaloya (Green), Nawalapitiya (Pole). *Exp.* 18-20 mill. Type in B. M.

2103*d*. *RIVULA PROCRITA*, Swinh. A. M. N. H. (7), xvi., p. 621 (1905).

Forewing with vein 10 absent or very short.

♀. Head and thorax white or pale brown mixed with dark red-brown; palpi, pectus, and legs brown, tarsi blackish slightly ringed with white; abdomen fuscous, whitish at base. Forewing white or pale brown slightly irrorated with brown; a red brown patch on costa near base with the indistinct irregularly waved antimedial line arising from its outer edge and expanding into a patch at inner margin; a medial red-brown band expanding into a triangular patch at costa, narrowing at lower angle of cell and expanding into a wedge-shaped patch at median nervure with a >-shaped black mark on it; postmedial line arising from outer edge of the band, bent outwards below costa, incurved below vein 4 and joining the band at inner margin; terminal area red-brown with two white points on costa, an indistinct blackish subterminal line excurved below vein 7 and at middle, a white spot beyond it at apex with five black marks below it and some small white spots towards tornus; a terminal series of black points with white striæ on their inner sides. Hindwing fuscous brown with a slight pale line at base of cilia; the underside whitish tinged with brown, the terminal area suffused with brown, a fuscous discoidal lunule and curved postmedial line.

Habitat.—ASSAM, Khâsis; BALI. *Exp.* 22 mill.

URANIADÆ.

3045*d*. *EPIPLEMA FULVIHAMATA*, n. sp. (pl. G., f. 14).

Forewing with the termen very slightly angled at vein 6, hindwing with the costa excised beyond middle and produced to points at veins 6 and 4.

Head and thorax red-brown tinged with purplish grey; palpi above and frons black; pectus and legs whitish, the forelegs fuscous above; abdomen grey tinged with brown, the medial segments with blackish dorsal marks. Forewing greyish suffused with purple-brown and striated with blackish; traces of an interrupted waved antemedial line bent inward to costa; postmedial line double tinged with fulvous and oblique from costa to vein 5, then indistinct, pale, and incurved from vein 4 to submedian fold, then defined by black on inner side and slightly excurved; a terminal black point below apex, then a dark band with diffused black and fulvous on its inner edge, angled outwards at vein 6 and ending on termen at vein 2. Hindwing with the costal half purplish, the inner half purplish grey-brown striated with black; a fulvous streak in lower part of cell hooked on discocellulars and with some black beyond its angle; postmedial line ochreous, defined on inner side by brown from costa to discal fold and below vein 4 by black and fulvous, oblique and slightly sinuous from costa to vein 4 where it is acutely angled outwards, then nearly straight; a whitish line from termen at vein 7 to termen at vein 2, defined by black on outer side and produced to termen as short white streaks at discal fold and veins 4·3; the underside brownish white slightly striated with black.

Habitat.—CEYLON, Kandy, Peradeniya (Green); PULO LAUT (Doherty). *Exp.* 22 mill. Type in B. M.

GEOMETRIDÆ.

BOARMIANÆ.

3148*a*. *SYNEGIA CONFLAGRATA*, n. sp.

♀. Head, thorax and abdomen fiery red mixed with yellow; palpi brownish; frons yellow below and with red and brown bars above; antennæ brown, the shaft above and a line between their bases pure white; pectus and legs ochreous and brownish, the forelegs brown; ventral surface of abdomen whitish. Forewing yellow and fiery red almost entirely suffused with fuscous brown, leaving some of the ground colour at base, as irroration on medial costal area, as ante and postmedial patches on inner margin, as a semicircular patch on termen from apex to vein 4, and lunulate spots towards tornus; an interrupted red and yellow antemedial line, excurved below costa; a postmedial white spot in submedian fold at the apex of the patch on inner margin; some brown striæ on termen; cilia yellow intersected with brown towards apex and at middle. Hindwing yellow suffused with fiery red; some brown at base; a dark discoidal point

with the indistinct sinuous brown medial line just before it; postmedial line double, fiery red filled in with yellow, waved; a strong brown subterminal line, angled outwards to termen at discal fold and produced as streaks to termen at veins 4, 3, 2; the underside ochreous, a brown subbasal line except towards costa, medial line brown, waved, double towards inner margin, the discoidal point just beyond it, postmedial line brown, curved, waved, the subterminal line connected at discal fold with a lunulate patch on termen.

Habitat.—MADRAS, Nilgiris (Andrewes). *Exp.* 36 mill. Type in B. M.

3235. *MACARIA SUBALBATARIA*.

Larva.—Bistre brown; two black dorsal lines with a white line between them; two fine lateral black lines; ventral surface paler: head bistre brown with black spots. 6 (W. H. Campbell).

3236a. *MACARIA HONORIA*, n. sp.

Head and thorax dark-brown mixed with some grey: palpi ochreous at base and white at tips: frons with white points at sides, antennæ with the basal point white in front; pectus yellow, legs yellow irrorated with brown, the tibiæ and tarsi brown above; abdomen yellow, dorsally dark-brown except at extremity. Forewing purplish grey irrorated and striated with dark-brown, the basal and costal areas suffused with brown, the medial area pale grey except towards costa; an oblique antemedial dark-brown bar from costa; a small black-brown discoidal spot; postmedial line dark-brown, strong oblique and slightly sinuous to vein 7, then bent inwards to discal fold, then slightly oblique, a patch of black-brown above its angle on costal area, then a band of dark-brown suffusion beyond it emitting a diffused fascia from the angle of the line to termen; a terminal series of black-brown points; cilia brownish with white line at base, chequered with dark-brown towards apex. Hindwing purplish grey striated with brown; the basal area suffused with brown, a whitish subbasal spot in cell, its outer edge incurved before the small round black discoidal spot placed on the paler medial area; postmedial line blackish, almost straight, a broad band of brown suffusion beyond it and rather wedge-shaped black patches between veins 6·7 and 4·3, the former extending at extremity to discal fold; the terminal area with dark-brown patch between veins 6 and 4; a terminal series of slight dark lunules; cilia whitish at base, brownish at tips, dark between veins 6 and 4. Underside of both wings with the basal area pale striated with brown, the terminal area fuscous brown with white subapical spot on forewing, the hindwing with some white striæ near inner edge of the dark area and on apical area and an irregular white patch striated with brown at middle of termen.

Habitat.—MADRAS, Nilgiris (Andrewes). *Exp.* 42 mill. Type in B. M.

3236b. *GARÆUS FLAVIPICTA*, n. sp.

♂. Head and thorax fiery red; antennæ with the shaft whitish, the

THE MOTHS OF INDIA.

EXPLANATION OF PLATE G.

- | | |
|---|--|
| 1. <i>Arbela theivora</i> . | 23. <i>Ufeus carnea</i> . |
| 2. <i>Celama leucoscopula</i> . | 24. <i>Anytus leucocynna</i> . |
| 3. „ <i>mesotherma</i> . | 25. <i>Tichestra serrata</i> . |
| 4. „ <i>rufimixta</i> . | 26. <i>Dichonia chlorata</i> . |
| 5. „ <i>dentilinea</i> . | 27. <i>Chloroclystis plicata</i> . |
| 6. <i>Roeselia pallidiceps</i> . | 28. <i>Prasinoxena metaleuca</i> . |
| 7. <i>Zia ectrocta</i> . | 29. <i>Melissoblaptes monochroa</i> . |
| 8. <i>Ilema atrifrons</i> . | 30. <i>Crambus endopolia</i> . |
| 9. <i>Halone flavinigra</i> . | 31. „ <i>neurigrammalis</i> . |
| 10. <i>Asura phantasma</i> . | 32. „ <i>albiceps</i> . |
| 11. „ <i>toxodes</i> . | 33. <i>Chilo aræalis</i> . |
| 12. „ <i>fulvimarginata</i> . | 34. <i>Prorophora dialenca</i> . |
| 13. <i>Neasura taprobana</i> . | 35. <i>Heterographis augentescens</i> . |
| 14. <i>Epiplema fulvhamata</i> . | 36. <i>Nephopteryx rhodobasalis</i> . |
| 15. <i>Cidaria nyctichroa</i> . | 37. <i>Thermopteryx rubrifusa</i> . |
| 16. <i>Gymnoscelis lobata</i> . | 38. <i>Spatulipalpia albistrialis</i> . |
| 17. <i>Chloroclystis dentatissima</i> . | 39. <i>Lepidogma chlorophilalis</i> . |
| 18. „ <i>polygraphata</i> . | 40. <i>Macalla eumictalis</i> . |
| 19. <i>Utetheisa pulchelloides</i> . | 41. <i>Trichophysetis umbrifusalis</i> . |
| 20. <i>Episilia clavata</i> . | 42. „ <i>Bostra mesaleucalis</i> . |
| 21. „ <i>arenacea</i> . | 43. <i>Oligostigma andreusialis</i> . |
| 22. <i>Lycophotia poliades</i> . | 44. <i>Massepha rufescens</i> . |



Horace Knight del. et lith.

West, Newman chromo.

INDIAN MOTHS.

branches brownish, abdomen yellow tinged with red and brown. Forewing fiery red with a few dark striæ, the medial area with diffused yellow patches on costal area and below the cell and an oblique yellow bar from costa before the angle of postmedial line, the costal edge yellowish on basal area; a diffused brownish antemedial line oblique from costa to median nervure, then slightly waved; a black discoidal point; postmedial line dark slightly defined by violaceous on outer side, acutely angled outwards below costa, then oblique; the apex brownish with some violaceous irroration. Hindwing fiery red sparsely striated with black, the terminal area with a faint violaceous gloss; medial area yellow, narrowing towards costa and with slight red marks on its outer edge towards inner margin, bounded by the dark postmedial line which is excurved and minutely waved from vein 4 to inner margin. Underside of both wings yellow striated with black and with diffused patches of rufous suffusion especially on tornal area of forewing and apical area of hindwing which has the postmedial line excurved between veins 4 and 2.

Habitat.—N. ASSAM, Dibrugrah (Ward). *Exp.* 38 mill. Type in B. M. 3528a. *ABRAXAS DIVERSICOLOR*.

Larva.—Dull fuscous; a pale yellow dorsal stripe interrupted at the junction of the somites; spiracular line red with a series of minute red specks above it; head prominent, glabrous, red; legs and preanal claspers red, anal segment and anal claspers whitish. Food plant *Rhododendron*. (W. H. Campbell).

LARENTIANÆ.

3643a. *CIDARIA NYCTICHOA*, n. sp. (Pl. G., f. 15.)

♂. Head, thorax and abdomen reddish brown mixed with some grey and black, the tegulæ, prothorax and abdomen with blackish bands, the metathorax with black crest; pectus, legs and ventral surface of abdomen brownish white, the fore tibiæ and tarsi black with pale rings. Forewing reddish brown suffused with a black and with numerous minutely waved black lines, the double antemedial line and the postmedial line rather more prominent, the latter excurved below costa and at middle; a waved greyish subterminal line and black terminal line. Hindwing red-brown suffused with black and with numerous waved black lines except on costal area which is greyish; a black terminal line; the underside whitish irrorated with fuscous, curved sinuous medial and postmedial blackish lines and a broad diffused subterminal band.

Habitat.—MADRAS, Palnis (Campbell). *Exp.* 28 mill. Type in B. M.

3738. *PHOTOSCOTOSIA VENIPICTA* insert (syn.) *Eustroma pilosa*, Th. Mieg. Le Nat. 1910, p. 34.

3747b. *POMASIA PUNCTARIA*, n. sp.

♀. Head white with blackish bars above from and between antennæ,

the back of head and tegulæ yellow, the latter with blackish patches; palpi blackish banded with white; antennæ brown, the basal joint white in front; thorax brown with white patches on patagia; pectus and legs yellow, the fore and mid tibiæ and tarsi banded with brown; abdomen dark-brown with dorsal series of white spots and segmental lines, the extremity and ventral surface orange-yellow. Forewing brown with numerous waved white lines with series of small spots between them, the apical area and termen with the markings orange-yellow; a white discoidal annulus with white point in centre; the termen with a series of orange lunules concave towards base. Hindwing brown with numerous waved white lines with series of small spots between them, the terminal area with the markings orange-yellow.

Habitat.—MADRAS, Nilgiris (Andrewes). *Exp.* 24 mill. Type in B. M.

3754. GYMNOSCELIS SUBTRIGOSA, insert *Eupithecia substrictigera*, Wk., XXXV., 1879, (1866); which has precedence.

Larva.—Black; two yellow-green dorsal lines conjoined at the junctions of the somites by bands of the same colour; a spiracular series of yellow-green spots and a few similar spots on the ventral surface; head black, glabrous. Feeds gregariously on a species of low-growing Fig. (W. H. Campbell.)

3755a. GYMNOSCELIS LOBATA, n. sp. (Pl. G., f. 16.)

Hind tibia with long inner medial spur, the outer spur absent: hindwing of male with costal lobe folded over on underside, the inner area folded over on underside and grooved.

♂. Head, thorax and abdomen ochreous mixed with reddish brown, the underside ochreous whitish, the fore tibiæ and tarsi fuscous ringed with white. Forewing greyish ochreous irrorated with fuscous; subbasal line represented by slight double dark striæ from costa; antemedial line slight, waved, inwardly oblique, a waved dark band beyond it with the black discoidal striga on its outer edges; a faint double minutely waved medial line; postmedial line double, minutely waved and obliquely curved, with fuscous suffusion on its inner side; subterminal line pale, minutely waved, with fuscous suffusion on its inner side, the area beyond it purple; a fine dark terminal line; cilia ochreous and fuscous. Hindwing greyish ochreous irrorated with fuscous; traces of double waved ante and post-medial lines; a rather punctiform blackish subterminal line, the area beyond it tinged with purple; a fine black terminal line; cilia ochreous and fuscous. Underside of forewing suffused with purple except the inner area to beyond middle, a curved whitish postmedial band with deeper purple before and beyond it; hindwing whitish, the costal fold fulvous, an obliquely curved purple postmedial band from costa to vein 4 and a terminal band.

♀. Head and abdomen more fulvous ; wings tinged with green ; forewing with the suffusion before postmedial and subterminal lines rufous, no purple on termen ; the underside with the purple replaced by brown.

Habitat.—CEYLON, Madulsima (Vaughan), Maskeliya (Alston), Ambawela (Green), Hakgala (Green). *Exp.* ♂ 18, ♀ 20 mill. Type in B. M.

3770b. *CHLOROCLYSTIS DENTATISSIMA*, Warr., Nov. Zool., v., p. 428 (1898). (Pl. G., f. 17.)

♀. Head, thorax and abdomen grey tinged with reddish brown ; palpi fuscous towards tips ; fore tarsi brown ringed with whitish. Forewing grey suffused and irrorated with brown ; subbasal line represented by a black striga from costa, the antemedial line by black striæ from costa and inner margin and at median nervure, inwardly oblique ; a blackish point on middle of costa ; postmedial line faint, waved, with short black streaks on the veins, oblique from costa to vein 6, angled inwards at discal fold and oblique below vein 4 ; subterminal line whitish, minutely dentate, defined on inner side by slight dark streaks on the veins ; a terminal series of black striæ with minute streaks before them in the inter spaces. Hindwing grey suffused and irrorated with brown ; indistinct minutely waved, subbasal antemedial and medial lines ; postmedial line blackish, curved, slightly incurved at discal fold, with another faint line beyond it ; subterminal line whitish defined on inner side by brown, minutely dentate ; a terminal series of black striæ ; the underside brownish white with curved dark medial and postmedial lines except on inner area, a fine black terminal line.

Habitat.—CEYLON, Peradeniya (Green), Colombo (Mackwood) ; Cocos KEELING I ; KEY IS ; N. AUSTRALIA, Port Darwin. *Exp.* 18-22 mill.

3770c. *CHLOROCLYSTIS POLYGRAPHATA*, n. sp. (Pl. G., f. 18.)

♀ Head, thorax and abdomen grey mixed with fuscous and tinged in parts with rufous ; palpi, sides of frons, pectus and legs blackish, the tarsi slightly ringed with white. Forewing grey, slightly tinged with reddish brown and irrorated with fuscous ; subbasal line double, curved, from costa to submedian fold, the inner line indistinct, antemedial area with two indistinct waved lines, the antemedial line black, diffused and oblique to median nervure, then minutely waved, the medial area with two lines, oblique to just below cell, then minutely waved ; a strong black postmedial lunule with blackish patches above it on costa and black points below it on veins 3 and 2 ; postmedial line fine, on a pale band slightly angled outward at vein 6, oblique to below vein 4, then minutely waved, a diffused lunulate dark line beyond it ; subterminal line whitish defined on each side by fuscous, minutely waved ; cilia fuscous intersected with whitish. Hindwing grey tinged with brown ; a black mark on base of median nervure and two spots an inner margin ; two obscure antemedial lines angled outwards at middle and interrupted in submedian inter space ; postmedial line double,

the inner line with slight dentate black marks before it on median nervules, angled outwards at middle, then incurved and minutely waved; subterminal line double, maculate, oblique from costa to vein 3 where it is obtusely angled; a series of fuscous spots just before termen from apex to vein 3; cilia tinged with ochreous and with series of fuscous spots at base. Underside of both wings suffused with fuscous brown; hindwing with obscure maculate postmedial line excurved at middle.

Habitat.—CEYLON, Hakgala (Green). *Exp.* 28 mill. Type in B. M.

3773*b*. *COLOROCLYSTIS PLICATA*, n. sp. (Pl. G., f. 27.)

Forewing of male with the costa folded over on upperside from before middle to towards apex.

Head, thorax and abdomen grey suffused with reddish brown, palpi blackish except at base, the tips of 3rd joint white. Forewing grey suffused with red-brown and with some black irroration on the veins; antemedial line indistinct, double, waved; three oblique blackish striæ from medial part of costa; postmedial line indistinct, double, minutely waved, excurved to vein 4, then oblique; subterminal line grey, minutely waved, with slight black streaks before it below costa and at middle and beyond it in the inter spaces; a terminal black line. Hindwing grey suffused with red-brown, the median nervure and veins beyond lower angle of cell irrorated with black to the indistinct double whitish postmedial line which is excurved at middle; an indistinct dentate whitish subterminal line; a black terminal line.

Habitat.—CEYLON, Hakgala (Green), Ohiya (Green), Newara Eliya (Mackwood), Horton Plains. *Exp.* 26 mill.

ACIDALIANÆ.

3925. *EPHYRA VALIDARIA*, insert (syn.) 4076*a*. *Geometra rufifrontaria*.

3971*a*. *TIMANDREA FLAVISONSARIA*, n. sp.

Head rufous; antennæ whitish towards base and with white bar between their bases; thorax yellow tinged with rufous; legs rufous; abdomen yellow tinged with rufous. Forewing ochreous yellow, the costal and terminal areas suffused with rufous and irrorated with blackish; antemedial rufous points on median nervure and vein 1; a minute rufous discoidal spot; traces of an oblique postmedial line defining the rufous terminal area, obsolete towards costa and excurved between vein 5 and submedian fold; subterminal line with diffused oblique blackish streak from apex, then represented by a series of black points; a fine red-brown terminal line; cilia rufous. Hindwing ochreous yellow slightly striated with brown, the terminal half suffused with rufous; an oblique red-brown medial line with rufous band beyond it and fuscous patch on costal area; a brown postmedial line excurved between veins 4 and 2; a fine red-brown terminal line; cilia rufous. Underside of both wings tinged with rufous

and prominently striated with blackish, the postmedial line black, excurved between veins 5 and 2, a black terminal line; forewing with black discoidal spot.

Habitat.—MADRAS, Wynâd (Cardew), Nilgiris (Andrewes); BURMA, Katha (Bingham). *Exp.* 30 mill.

PYRALIDÆ.

GALLERIANÆ.

4141c. *PRASINOXENA METALEUCA*, n. sp. (Pl. G., f. 28).

♂. Head, thorax and abdomen white, the patagia green. Forewing apple-green with two brownish grey discoidal points and one in discal fold beyond the cell; the costal edge brown towards apex; cilia white with waved brown line at base and fuscous tips. Hindwing white. Underside of forewing with the fringe of hairy scales on and beyond median nervure ochreous white.

Habitat.—CEYLON, Kandy (Mackwood). *Exp.* 16 mill. Type in B. M.

4144c. *MELISSOBLAPTES MONOCHROA*, n. sp. (Pl. G., f. 29).

♂. Head, thorax and abdomen brownish white. Forewing pale brownish ochreous, sparsely irrorated with black; a subbasal black point in cell; a series of black points on costa towards apex and on termen from apex to vein 2. Hindwing uniform pale brownish ochreous.

Habitat.—CEYLON, Ambalangoda (Pole). *Exp.* 32 mill. Type in B. M.

CRAMBINÆ.

4156b. *CRAMBUS ENDOPOLIA*, n. sp. (Pl. G., f. 30).

♂. Head and thorax pale grey-brown; pectus, legs and abdomen whitish tinged with brown. Forewing pale grey-brown, the inner area paler to submedian fold, the veins beyond the cell slightly streaked with whitish and defined above and below by faint brown streaks; traces of a brown point at middle of vein 1 and discoidal point; an indistinct highly curved postmedial brown line. Hindwing white tinged with brown; the underside with the inner area whiter.

Habitat.—CEYLON, Wellawaya (Green). *Exp.* 26 mill. Type in B. M.

4169a. *GRAMBUS NEURIGRAMMALIS*, n. sp. (Pl. G., f. 31).

Head and thorax white, sides of palpi, antennæ and patagia golden bronze; abdomen white faintly tinged with ochreous. Forewing white; a diffused golden bronze fascia on costal area to subterminal line and another on median nervure to well beyond angle of cell; a black discoidal spot; the veins beyond the cell defined by fine golden bronze streaks; a double highly curved subterminal line with small wedge shaped black-brown mark beyond it on costa; a black-brown terminal line. Hindwing white with a slight bronze terminal line from below apex to submedian fold.

Habitat.—CEYLON, Ambalangoda (Pole). *Exp.* ♂ 16, ♀ 18 mill. Type in B. M.

4178*b*. CRAMBUS ALBICEPS, n. sp. (Pl. G., f. 32).

♀. Head and thorax grey tinged with brown, the vertex of head whitish; abdomen white tinged with brown. Forewing grey tinged with reddish brown and thickly irrorated with brown; a slight blackish discoidal point and blackish terminal line; cilia with a silvery gloss. Hindwing white tinged with brown, the cilia white; the underside white faintly tinged with brown.

Habitat.—CEYLON, Haputale (Alston). *Exp.* 18 mill. Type in B. M.

4202*c*. CHILO AREALIS, n. sp. (Pl. G., f. 33).

Forewing with vein 8, 9, 10 stalked, 11 anastomosing with 12.

♂. Head, thorax and abdomen pale ochreous yellow; forelegs brownish, the tibia and tarsus whitish in front. Forewing pale ochreous yellow slightly irrorated with brown and the veins defined by faint brown streaks; traces of an oblique antemedial brown line from vein 2 near base to vein 1; a triangular blackish discoidal spot with a brownish streak from it to termen; postmedial line rather oblique and formed of faint dark streaks from costa to vein 6, then very oblique to middle of inner margin and minutely dentate; two black points on termen above tornus. Hindwing white; the underside with the costal area tinged with ochreous.

Habitat.—MADRAS, Palnis (Campbell). *Exp.* 26 mill. Type in B. M.

4203. CHILO SIMPLEX.

Larva.—Pinkish grey sparsely covered with fine hairs; two faint pale brown dorsal stripes; a diffused lateral band of the same colour; a supra-spiracular series of small black specks; in some cases the whole body is suffused with brown; head red, glabrous; thoracic plate horny. Feeds in the heads and stems of the great millet and *Holcus spicatus*, boring down into the head as the ear is formed and settling in the stem in which it pupates; the whole upper part of the plant rots; very destructive. (W. H. Campbell).

4205. CHILO SUPPRESSALIS, insert (syn). *Chilo auricilia* Dudgeon. J. Bomb. Soc. xvi., p. 405 (1905).

Food plant Sugarcane.

ANERASTIANÆ.

4279*a*. AMBALA ALBIVENALIS, n. sp.

Maxillary palpi flattened against frons; antennæ of male strongly laminate and with ridge of scales in sinus at base of shaft; hindwing with veins 3 and 5 stalked to near termen.

Head and thorax white mixed with rufous; abdomen white dorsally suffused with fulvous yellow at base. Forewing ochreous tinged with rufous and slightly irrorated with black, the veins prominently streaked with white; an antemedial black point on vein 1; a postmedial black point

on vein 1 and usually an oblique striga between veins 5 and 2; a terminal series of slight black points. Hindwing white with a faint ochreous brown tinge; the cilia pure white.

Habitat.—CEYLON, Puttalam. (Pole) 1 ♂, 1 ♀, Haputale (Alston) 1 ♂, Kegalle (Alston) 1 ♂. *Exp.* 12-20 mill.

4285a. *ANERASTIA CASTANEALIS*, n. sp.

♀. Head, thorax and abdomen chestnut-red; pectus, legs and ventral surface of abdomen paler, the tarsi fuscous ringed with white. Forewing pale chestnut-red, deeper red towards costa; the ante- and postmedial lines represented by traces of short deep red streaks. Hindwing white, the costa and termen slightly tinged with brown; the underside with the costal area tinged with brown.

Habitat.—CEYLON, Kegalle (Alston). *Exp.* 16 mill. Type in B. M.

4299a. *SALURIA HEMIPHÆALIS*, n. sp.

Head and thorax fuscous, the metathorax rufous; abdomen grey dorsally tinged with rufous. Forewing with the costal half fuscous, the inner half rufous, the costal area with a white fascia tapering to a point just before apex. Hindwing semihyaline whitish tinged with brown; cilia whitish with a brown line through them.

Habitat.—CEYLON, Haldamulla (Mackwood), Haputale (Alston). *Exp.* 22-26 mill. Type in B. M.

4304b. *CRITONIA OCHRACEALIS*, n. sp.

Palpi of male oblique, the 2nd joint hollowed out to receive the brush like maxillary palpi; antennæ serrate, with large tuft at base of shaft.

Head and thorax brownish ochreous; abdomen ochreous. Forewing ochreous with a brownish tinge below costal area from base to apex; the costal edge blackish at base; a blackish antemedial point on vein 1; an ill-defined blackish discoidal spot; an oblique postmedial series of blackish points on the veins; an oblique blackish bar from apex and terminal series of black points. Hindwing semihyaline ochreous, the costal area tinged with brown towards apex; a fine dark terminal line. Underside of forewing suffused with fuscous brown, except on inner and terminal areas, more extensively suffused in female.

Habitat.—PUNJAB; Kangra Valley (Dudgeon); MADRAS, Nilgiris (Andrewes). *Exp.* ♂ 26, ♀ 30 mill. Type in B. M.

4312. *POLYCHA DEFRESSELLA* insert (syn). *Polyocha saccharella* (Dudgeon) J. Bomb. Soc. xvi, p. 405 (1905).

This belongs to Sect. II; but the forewing has veins 4·5 approximated for some distance and veins 10 from the cell, hindwing with veins 3 from angle of cell and 8 free.

Larva on sugarcane.

4326a.—*HETEROGRAPHIS ARGENTESCENS*, n. sp. (Pl. G., f. 35).

♀. Head and thorax rufous with some silvery scales; antennæ blackish

abdomen ochreous brown. Forewing ochreous mostly suffused with bright rufous; traces of an oblique dark antemedial line with silvery scales before it towards inner margin; an oblique medial band of silvery suffusion; an indistinct oblique dark postmedial line with band of silvery suffusion beyond it; the inner margin blackish from near base to a dark brownish batch at tornus; cilia silvery whitish at tips. Hindwing ochreous brown. the cilia silvery white except at base.

Habitat.—CEYLON, Kegalle (Alston). *Exp.* 20 mill. Type in B. M.

PHYCITINÆ.

Genus PROROPHORA.

Type.

Prorophora, Rag., Ann. Soc. Ent. Fr. 1887, p. 252 *curvibasella*.

Proboscis well developed; palpi down-curved, typically extending about the length of head; maxillary palpi slightly tufted with hair; frons with pointed prominence hidden in a tuft of hair; antennæ of male almost simple. Forewing long and narrow, the apex rounded; vein 3 from angle of cell; 4·5 on a long stalk from above angle; 8·9 stalked; 10·11 from cell. Hindwing with vein 3 from angle of cell; 4·5 on a long stalk; 6·7 from upper angle; 8 not anastomosing with 7.

4335*b*. PROROPHORA DIALEUCA, n. sp. (Pl. G., f. 34).

Palpi extending twice the length of head.

♀. Head, thorax and abdomen grey suffused with brown. Forewing grey suffused with brown and slightly irrorated with fuscous; a white streak above median nervure from before middle of cell to termen at discal fold, emitting minute spurs on bases of veins 4·3; slight fuscous medial marks on median nervure and vein 1, and a postmedial series of minute diffused streaks on the veins, oblique below vein 4; the veins slightly streaked with whitish towards termen which is more strongly irrorated with brown. Hindwing semihyaline white, the termen faintly tinged with ochreous brown.

Habitat.—CEYLON, Elephant Pass (Mackwood), Jaffna (Mackwood). *Exp.* 24 mill. Type in B. M.

Genus HYPHANTIDIUM.

Type.

Hyphantidium, Scott., Proc. Zool. Soc., 1859, p. 207 .. *sericaria*.

Assara, Wlk., xxvii, 79 (1863) *albicostalis*.

Cateremna, Meyr., Pr. Linn. Soc., N. S. W., vii, p. 156

(1882) *microdoxa*.

Seneca, Hulst., Trans. Am. Ent. Soc., xvii, p. 177 (1890).. *tumidella*.

4345. HYPHANTIDIUM ALBICOSTALIS, Wlk., xxvii, 80 (1869); Rag. Rom.

Mém., viii, p. 73, pl. xxv., f. 14.

Euzophera subterebrella, Snell., Tijl. V. Ent., xxiii, p. 250 (1880);

id., xxvii, p. 54, pl. v., f. 12.

„ *nirricostella*, Hmps., Moths. Ind., iv., p. 74 (1896).

4354a. NEPHOPTERYX NEPHELOALIS, n. sp.

♀. Head, throat and abdomen grey suffused with brown; pectus and ventral surface of abdomen whitish; tarsi blackish ringed with white. Forewing grey suffused with brown; some diffused whitish from base of costa followed by a dark shade; an oblique whitish diffused antemedial band with the slight double brown antemedial line on its outer edge followed by a blackish shade from costa to median nervure; two obliquely placed blackish discoidal spots; subterminal line whitish defined on each side by dark lines and with slight oblique dark shade from its inner side at costa, slightly excurved at middle and very minutely waved: a terminal series of blackish points. Hindwing pale suffused with brown; cilia whitish with a brown line near base.

Habitat.—CEYLON, Trincomali (Green). *Exp.* 20 mill. Type in B. M.

4359d. NEPHOPTERYX RHODOBASALIS, n. sp. (Pl. G., f. 36.)

Antennæ of male with large tuft of scales from basal joint and sinus at base of shaft but without tuft of scales in it; the tibiæ broadly scaled; large black anal and genital tufts with some silvery scales in them.

Head and thorax ochreous tinged with rufous; tibiæ and tarsi banded with blackish; abdomen fuscous, ochreous at base. Forewing with the basal area whitish tinged with pink and rufous and with dark patches on costa at base and before middle; antemedial line double, oblique, formed of raised blackish and silvery scales; the rest of wing fuscous mixed with greyish; two obscure discoidal spots with some whitish before and beyond the lower; subterminal line indistinct, double filled in with whitish, the inner line minutely dentate, slightly incurved below costa; a terminal series of black points; cilia with a fine whitish line at base followed by a dark line. Hindwing semihyaline whitish, the veins and a terminal line brown; cilia with a dark line near base.

Habitat.—CEYLON, Madulsima (Vaughan). *Exp.* 18 mill. Type in B. M.

4359e. NEPHOPTERYX ACROBASILLA, n. sp.

Maxillary palpi of male dilated with scales and flattened against the frons; antennæ with sinus at base containing a tuft of scales; thorax with tufts of long hair from below base of hindwing.

Head and thorax grey mixed with some red and pale olive brown, the tarsi fuscous ringed with white; abdomen brownish ochreous with grey and fuscous bands. Forewing grey irrorated with purplish red; some olive ochreous on basal inner area; the first line medial, blackish, oblique, straight, with a conical olive ochreous band before it, not quite reaching costa, and defined on inner side by band of raised blackish, red and silvery

scales from cell to inner margin; two black discoidal points; an olive ochreous postmedial band from submedian fold to inner margin; subterminal line whitish defined on inner side by black and on outer by red, almost straight, oblique; a fine black terminal line; cilia whitish with an ochreous line at base followed by a fine dark line. Hindwing semihyaline whitish tinged with brown; a blackish terminal line; cilia with a dark line near base.

Habitat.—CEYLON, Hambantota (Bainbrigge-Fletcher). *Exp.* 18 mill. Type in B. M.

4370*d*. NEPHOPTERYX FERREOTINCTA, n. sp.

♀. Head, thorax and abdomen grey-brown mixed with whitish; tarsi fuscous ringed with white; abdomen with brownish dorsal bands towards base, the anal tuft ochreous, the ventral surface white. Forewing white, thickly irrorated and suffused with grey-brown and with some rufous especially on inner area before and beyond the subterminal line; antemedial line ill-defined, whitish, with diffused black patch before it on inner half and diffused white patch beyond it, oblique from costa to submedian fold, then incurved; two indistinct conjoined brown discoidal points; subterminal line white, slightly angled inwards at discal and submedian folds; a terminal series of blackish points; cilia with a white line near base. Hindwing semihyaline whitish, the costal area tinged with brown; a fine brown terminal line and line near base of cilia.

Habitat.—CEYLON, Matale (Pole). *Exp.* 20 mill. Type in B. M.

Genus THERMOPTERYX, nov.

Type.—*T. rubrifusa*.

Palpi upturned, the second joint reaching about to vertex of head and moderately fringed with scales in front, the third short; maxillary palpi slightly dilated with scales; frons smooth; antennæ of female almost simple; tibiæ slightly fringed with hair. Forewing with veins 2-3 on a long stalk; 4-5 closely approximated for about half their length and not in line with median nervure; 6 from upper angle; 8-9 stalked and 10 closely approximated to them for about half its length. Hindwing with vein 3 from angle of cell; 4-5 strongly stalked; 6-7 from upper angle; 8 not anastomosing with 7; the cell about half length of wing.

4382*a*. THERMOPTERYX RUBRIFUSA, n. sp. (Pl. G., f. 37.)

♀. Head, thorax and abdomen grey-white suffused in parts with rufous; palpi fuscous. Forewing grey-white irrorated with rufous; a patch of rufous suffusion on basal costal area; the inner area suffused with rufous from before middle where it extends almost to costa and thence obliquely to termen between veins 3 and 2; a patch of rufous suffusion at apex; two rufous discoidal points; a greyish subterminal line, slightly bent outwards at discal fold, then minutely waved; a terminal series of

rufous points. Hindwing semihyaline white, the costal area faintly tinged with rufous towards apex.

Habitat.—CEYLON, Trincomali (Green). *Exp.* 28 mill. Type in B. M.

4383c. MYELOIS ATRIMACULALIS, n. sp.

♀. Head, thorax and abdomen grey mixed with red-brown, the pectus, legs and ventral surface of abdomen greyer. Forewing grey suffused with red brown; a small subbasal black spot below costa; small antemedial black spots just below costa and on vein 1; a rather large blackish spot at lower angle of cell with two black points above it. a minutely dentate postmedial dark line from below costa to submedian fold, the veins beyond it with slight dark streaks ending in minute terminal black points. Hindwing greyish tinged with brown especially on apical area.

Habitat.—CEYLON, N. C. Province (Pole). *Exp.* 18 mill. Type in B. M.

4385a. PHYCITA UMBRATALIS, n. sp.

♂. Head and thorax grey-brown mixed with some fuscous; abdomen grey-brown; the tarsi with slight pale rings. Forewing grey suffused with fuscous-brown; antemedial line diffused, brown, curved, with black points before it on median and submedian nervures; a black discoidal point; the veins of postmedial area with short black streaks; subterminal line grey defined on inner side by black and on outer by red-brown; a terminal series of black points; cilia grey with brown lines at base and middle. Hindwing greyish white with fine brown lines on termen and near base of cilia.

Habitat.—MADRAS, Horsleykonda (Campbell). *Exp.* 18 mill. Type in B.M.

4389c. PHYCITA MELANOSTICTA, n. sp.

♀. Head, thorax and abdomen grey suffused with brown; tarsi fuscous ringed with white; ventral surface of abdomen white. Forewing grey suffused with brown and clouded in parts with fuscous; the first line medial, double, brown filled in with white and defined on outer side by white, slightly excurved below costa and with short black streak before it above vein 1; a slight curved black striga on upper discocellular and a blackish shade beyond the cell bent inwards below vein 4; postmedial line white, rather oblique from costa to vein 4 and slightly angled inwards in submedian fold; a terminal series of dark points, cilia whitish with a fine brown line near base. Hindwing semihyaline white, the costal area tinged with brown towards apex; a fine brown terminal line and line through the cilia.

Habitat.—CEYLON, Peradenya (Green), Habarana (Green). *Exp.* 22-24 mill. Type in B.M.

4393a. PHYCITA MIMELLA, Rag., Bull. Soc. Ent. Fr. 1889, p. ccxviii;
id. Rom. Mém. vii, p. 163, pl. viii, f. 3.

♀. Head, thorax and abdomen grey mixed with brown, the tarsi with pale rings. Forewing grey tinged in parts with brown and rather thickly

irrorated with black; antemedial line indistinctly double, oblique from costa to submedian fold and incurved at vein 1, a brownish patch before it in and below the cell, defined on inner side by a black bar; two small black discoidal spots; postmedial line indistinct, brown defined on outer side by whitish, arising below costa, oblique to vein 6, then minutely waved and somewhat bent outwards to inner margin, an oblique blackish shade beyond it from costa; a terminal series of black points; cilia white tinged with brown. Hindwing semihyaline white, the veins and costa towards apex tinged with brown; a fine brown terminal line from apex to vein 1: cilia with a fine brown line near base from apex to vein 1.

Habitat.—CEYLON, Kegalle (Alston); NEW GUINEA, Port Moresby. *Exp.* 18 mill.

4421b. SPATULIPALPIA ALBISTRIALIS, n. sp. (Pl. G., f. 38.)

Palpi of male with the second joint strongly dilated with a fold enclosing the brush-like maxillary palpi and fringed with hair on outer side at extremity; frons hollowed out; antennæ with the basal joint large, the shaft with sinus at base enclosing a large tuft of scales, then laminate; the vertex of head with ridge of scales; forewing with veins 8, 9, 10 stalked; hindwing with the lower angle of cell very strongly produced to half the length of wing, the median nervure and discocellulars closely approximated, veins 3, 4, 5 from angle, 4, 5 closely approximated for about one-third length.

♂. Head, thorax and abdomen bright rufous, the second joint of palpi in front, the basal joint of antennæ and tuft of scales in sinus, and the tegulæ at middle ochreous; tibiæ and tarsi banded with dark brown. Forewing bright rufous with fine blackish streaks on the veins; a silvery whitish streak below base of cell; antemedial line silvery whitish, strongly angled outwards in cell, then running inwards as a streak above median nervure to near base and on inner area represented by an oblique streak to inner margin with a streak from it above vein 1 to postmedial line; a silvery whitish streak in lower extremity of cell and short streaks in the interspaces beyond the cell; a blackish discoidal spot; postmedial line silvery whitish, arising from costa near apex, acutely angled inwards in discal fold and outwards at vein 5, then oblique to just above vein 1 to which it is slightly bent outwards; a fine black terminal line; cilia whitish at base and tips with fine red lines through them, brown at middle. Hindwing whitish tinged with brown; cilia with whitish line at base followed by a brown line.

Habitat.—CEYLON, Maskeliya (Alston), 1 ♂. type. *Exp.* 20 mill.

4421c. SPATULIPALPIA ALBICOSTALIS, n. sp.

♂. Head and tegulæ white slightly tinged with brown; thorax and abdomen pale brown, the anal tuft, pectus, legs and ventral surface of abdomen white tinged with ochreous. Forewing pale ochreous brown, the

costal area white slightly irrorated with brown; obliquely placed ante-medial dark points on and below costa; a slight white discoidal striga; a straight punctiform postmedial dark line slightly defined on outer side by whitish, and punctiform terminal line; a fine whitish line at base of cilia. Hindwing pale tinged with brown; a fine brown line near base of cilia.

Habitat.—CEYLON, Poyahawelle (Alston). *Exp.* 16 mill. Type in B. M.

4425a. *CRYPTOBLABES SCOTOCHROALIS*, n. sp.

♀. Head and thorax dark cupreous brown with a greyish glose; abdomen greyish suffused with brown; pectus, legs and ventral surface of abdomen whitish mixed with fuscous, the fore legs fuscous, the tarsi fuscous with slight pale rings. Forewing dark cupreous brown with a silvery grey glose; antemedial line rather strong, white, oblique from below costa to inner margin towards which it is diffused on inner side; subterminal line slight, whitish, somewhat excurved at middle then oblique; a faint greyish terminal band; cilia greyish. Hindwing greyish tinged with brown especially on the veins; cilia pale brownish with a white, line at base.

Habitat.—CEYLON, Kegalle (Alston). *Exp.* 14 mill. Type in B. M.

4427a. *CRYPTOBLABES FLAVIZONALIS*, n. sp.

♀. Head and thorax brownish white; palpi black at side; a black-brown band between antennæ; abdomen yellowish with lateral fuscous marks and dorsal black points on basal segments; the terminal segments fuscous with whitish bands; pectus, legs and ventral surface of abdomen white mixed with some fuscous, the tarsi fuscous ringed with white. Forewing white slightly irrorated with black, the inner area suffused with purple-red; obliquely placed subbasal black points below costa and cell; an antemedial olive-yellow band expanding on inner half and defined on each side by black lines overlaid by silvery scales; two black discoidal points; subterminal line white defined on inner side by a red line blackish and angled outwards below costa and on outer by a rather diffused black line overlaid by silvery scales with some red on its outer edge; a terminal series of black points; cilia whitish with brownish lines near base and tips. Hindwing white tinged with brown especially on the veins; the cilia whitish with a faint brownish line near base.

Habitat.—CEYLON, Kegalle (Alston). *Exp.* 12 mill. Type in B. M.

EPIPASCHIANÆ.

4538a. *LEPIDOGMA CHLOROPHILALIS*, n. sp. (Pl. G., f. 39.)

♀. Head and thorax green mixed with rufous and a few black scales; palpi black at tips; antennæ blackish except at base; tibiæ and tarsi banded with black; abdomen ochreous tinged with brown and with obscure blackish bands except at base. Forewing sap-green irrorated with black; the terminal half of costa red, the medial area sometimes irrorated with red; subbasal line represented by black points below costa and cell; some

black below the cell and on inner margin before the rather diffused oblique waved antemedial line; a discoidal tuft of black scales; postmedial line black defined on outer side by whitish, dentate, excurved from below costa to vein 2; subterminal line represented by a pale green band defined on inner side by dark green or blackish suffusion and on outer by a terminal series of dark green lunules; cilia chequered white and black. Hindwing pale almost wholly suffused with fuscous; a curved minutely waved diffused dark postmedial line defined on outer side by whitish; the termen purplish red with a terminal series of small black lunules; cilia whitish chequered with black from apex to vein 2; the underside whitish suffused with purplish brown, especially on terminal area. a curved dentate dark postmedial line.

Habitat.—CEYLON, Maskeliya, (Pole), Madulsima (Vaughan). *Exp.* 30 mill. Type in B. M.

4438*b*. *LEPIDOGMA MELANOLOPHA*, n. sp.

♀. Head, thorax and abdomen pale reddish brown; palpi black with pale ring at base and extremity of third joint; tibiae and tarsi black ringed with white. Forewing pale reddish brown sparsely irrorated with black; the costal area suffused with black to the postmedial line, the subbasal and antemedial lines represented by pale bars on it; a prominent tuft of black scales at upper angle of cell; a faint diffused fuscous shade beyond and below the cell; postmedial line black, strongly excurved below vein 6 and slightly incurved below vein 3; a terminal series of black striae and a fuscous shade on terminal area above tornus; cilia fuscous with a pale line at base. Hindwing pale reddish brown suffused with fuscous; a subterminal black bar at vein 2 defined on outer side by whitish; a blackish terminal line; cilia fuscous with a pale line at base; the underside ochreous whitish irrorated with fuscous especially on costal area, the terminal area tinged with fuscous, a pale postmedial line obliquely curved to submedian fold near termen.

Habitat.—CEYLON, Kegalle (Mackwood). *Exp.* 20 mill. Type in B. M.

4545*b*. *MACALLA BRACHYSCOPALIS*, n. sp.

Male with the antennal process short and hardly extending behind the head.

♂. Head and thorax olive-green with some black scales; palpi mostly black; antennal process black at tip; tarsi black with pale rings; abdomen olive green with some black scales, tinged with rufous and largely mixed with black towards extremity. Forewing olive-green irrorated with black especially towards costa, the terminal area slightly ringed with rufous; a pale oblique antemedial striga from costa; a discoidal tuft of black scales; postmedial line blackish defined on outer side by pale olive, oblique from costa to vein 5, excurved to vein 2, then again oblique to near tornus; a terminal series of small triangular black spots; cilia chequered olive and

blackish, with a fine pale line at base. Hindwing pale silky olive tinged with fuscous especially on terminal area; a terminal series of small triangular black spots; cilia with a fine pale line at base.

Habitat.—CEYLON, Maskeliya (Alston). *Exp.* 22 mill. Type in B. M.

4446b. *MACALLA EUMICTALIS*, n. sp. (Pl. G., f. 40.)

Head, thorax and abdomen greyish mixed with rufous and black; tarsi black with pale rings. Forewing greyish tinged with olive and in parts with rufous especially on medial area and irrorated with black, the apical area suffused with black; some black suffusion on base of inner margin and on costa before middle; antemedial line represented by a ridge of raised black scales, inwardly oblique from costa to vein 1, then bent outwards above inner margin; a sinuous medial ridge of black scales from cell to inner margin; a discoidal tuft of black scales and a diffused oblique ridge of scales from lower angle of cell to vein 1; postmedial line black, dentate, oblique from costa to vein 4, then erect and angled inwards at vein 2, a whitish patch before it beyond the cell; a terminal series of rather triangular blackish spots with a slight whitish patch before them at middle; cilia chequered rufous and blackish. Hindwing olive tinged with rufous and fuscous; cilia with a fine pale line at base.

Habitat.—CEYLON, Maskeliya (de Mowbray). *Exp.* ♂ 34, ♀ 40 mill.

ENDOTRICHINÆ.

4504a. *TRICHOPHYSETIS UMBRIFUSALIS*, n. sp. (Pl. G., f. 41).

♀. Head, thorax and abdomen white, the last faintly tinged with brown; palpi with some black scales; two black points between antennæ; fore tibiæ, the spurs and tarsi with black points. Forewing white with a faint brownish tinge on inner area except towards base and on terminal area; a black point below base of vein 1; an indistinct double curved brownish antimedial line with black points at costa and submedian fold; an indistinct double curved brownish postmedial line; a minutely waved fuscous line from costa towards apex to termen at vein 3, the area beyond it suffused with brown. Hindwing white, the terminal area tinged with brown; a double brown antemedial line with black spot on its outer edge in submedian fold; a double brown postmedial line with black spot on its inner edge at submedian fold almost touching the antemedial spot, and black point at inner margin; cilia brown; the underside with indistinct double subterminal line from costa to vein 3 with black spot on its inner side at costa.

ab. 1. Abdomen more suffused with brown and irrorated with black; forewing with the inner half from before middle suffused with brown and irrorated with black; hindwing with the inner area from before middle and the terminal area suffused with brown and black.

Habitat.—MADRAS, Nilgiris, Ootacamund (Cardew), Ouchterlong Valley (Andrewes). *Exp.* 22 mill. Type in B. M.

PYRALINÆ.

4546*l*. STEMMATOPHORA *ÆDALIS*, n. sp.

♀. Head, thorax and abdomen brownish grey irrorated with black; the tarsi with slight pale rings. Forewing grey tinged with brown and thickly irrorated with fuscous; antemedial line white, almost obsolete towards costa, angled outwards on median nervure and oblique towards costa and inner margin; postmedial line whitish, excurved at middle and above inner margin; a fine pale line at base of cilia. Hindwing grey suffused with brown, the inner area slightly tinged with purplish; a slight curved whitish postmedial line; a fine dark terminal line: cilia whitish with dark lines near base and tips; the underside grey tinged with purplish and thickly irrorated with fuscous, a curved white postmedial line defined on inner side by fuscous.

Habitat—MADRAS, Horsleykonda (Campbell). *Exp.* 22 mill.

4610*a*. BOSTRA *SARCOSIA*, n. sp.

♂. Head and thorax brownish ochreous; palpi blackish at tips; antennæ with the shaft ringed with black towards base; pectus and legs tinged with reddish and with black mixed, the tarsi black with pale rings; abdomen brownish ochreous irrorated with black, the anal tuft with some black, the ventral surface tinged with purplish red towards extremity. Forewing brownish ochreous with a slight flesh-coloured tinge and sparsely irrorated with black; a series of black points on costa; a black discoidal point; postmedial line formed of black scales, excurved to vein 3, then incurved; a terminal series of black striæ; cilia purplish red with black lines near base and tips. Hindwing ochreous irrorated with fuscous; a rather diffused fuscous curved postmedial line; a terminal series of black points: cilia purplish red with black lines near base and tips; the underside with the costal and terminal areas irrorated with black, a black discoidal point.

Habitat—CEYLON, Galgama (Mackwood). *Exp.* 14 mill. Type in B. M.

4611*a*. BOSTRA *MESOLEUCALIS*, n. sp. (Pl. G., f. 42).

♂. Head and thorax pale olive slightly tinged with rufous and with some blackish scales; legs whitish; abdomen whitish irrorated with black. Forewing pale olive, the medial area white irrorated with black, the terminal area irrorated with black; some diffused purplish red on base of median nervure; an oblique white antemedial line defined on inner side by purplish red suffusion; postmedial line white defined on inner side by diffused purplish red wedge-shaped patches at discal and submedian folds, oblique from the costa to vein 6, excurved to vein 4, then incurved; a blackish terminal line: cilia with a fine white line at base. Hindwing pale olive irrorated with fuscous; a blackish terminal line; cilia with a white line at base.

Habitat.—CEYLON, Maskeliya (Alston). *Exp.* 20 mill. Type in B. M.

HYDROCAMPINÆ.

4645c. *NYMPHULA GRISEALIS*, n. sp.

♀. Head and thorax grey tinged with brown; palpi with the 2nd joint fuscous at sides; abdomen reddish brown, the ventral surface grey. Forewing glossy brownish grey, the terminal area suffused with fuscous brown, a diffused brownish discoidal spot. Hindwing pale brownish grey: cilia of both wings with pale line at base followed by a darker line.

Habitat.—CEYLON, Peradeniya (Green). *Exp.* 18 mill. Type in B. M.

4671a. *OLIGOSTIGMA ANDREUSIALIS*, n. sp. (Pl. G. f. 43).

♀. Head and thorax whitish mixed with yellow-brown and fuscous scales; antennæ ringed with black; abdomen yellow mixed with brown and black and with whitish segmental rings. Forewing whitish suffused in parts with yellow and thickly irrorated with black; a double oblique fuscous postmedial line filled in with whitish from costa to vein 3, with fulvous orange suffusion before it, met at vein 3 by an oblique fulvous orange streak from origin of vein 2; a whitish streak from middle of inner margin, bent upwards to submedian fold in which it extends to the terminal band, some fulvous orange above it below origin of vein 2; an orange terminal band defined on inner side by a black line with a white line before it from costa to the whitish streak; cilia brownish white with a fuscous line near base. Hindwing orange, the base whitish with a diffused brown subbasal line; a diffused double brown medial line filled in with white; a white subterminal band defined on inner side by diffused brown and on outer by a black line; some slight black stiræ before the black terminal line forming at apex two spots with a white point between them: cilia brownish white; the underside paler, the subterminal band arising at discal fold.

Habitat.—MADRAS, Nilgiris (Andrewes). *Exp.* 18 mill. Type in B. M.

4681a. *OLIGOSTIGMA CHRYSOZONALIS*, n. sp.

♀. Head and thorax ochreous white; abdomen brownish ochreous with white segmental lines, the ventral surface white. Forewing brownish ochreous; a round orange discoidal spot defined by fuscous, a black point above it on costa, an indistinct oblique whitish band from before it to vein 1 and some whitish beyond and below it, an obscure orange streak on medial part of vein 1; postmedial line slight, dark, slightly defined by whitish on outer side, erect from just below costa to vein 2, then bent outwards to inner margin near tornus where it is met by a black line from median nervure just before end of cell, bent outwards below submedian fold, a golden yellow terminal band with fine black line on its inner edge from just below costa to above tornus with a white band before it with dark line on its inner edge; a terminal series of black points. Hindwing white; a fuscous brown band from costa beyond middle to inner margin near base;

a golden yellow terminal band with dark line on its inner edge excurved below costa, then slightly sinuous; two black terminal lines with some white between them, the inner slight and with some whitish before it at apex and from the lobe to tornus, both interrupted at the lobe on which there are two black points with silvery white points before them: cilia white with slight fuscous line through them and some fuscous at the iobe.

Habitat.—MADRAS, Palnis (Campbell). *Exp.* 24 mill. Type in B. M.

4700a. DAULIA ARGYROSTOTALIS, n. sp.

♂. Head and tegulae orange; palpi brownish at base; frons brownish with slight white lateral line; antennae brownish; thorax brownish mixed with silvery white; abdomen white irrorated with brown. Forewing brownish grey irrorated with silvery scales and with obscure orange rufous markings; some orange rufous on basal area, a rather diffused antemedial line, a discoidal lunule and a diffused incurved postmedial band; the terminal area rather yellower with a silvery subterminal band on it. Hindwing brownish grey irrorated with silver; some orange yellow below and beyond lower angle of cell; a small dark spot below the angle of cell and another above tornus; a diffused incurved dark band from costa beyond middle to termen at vein 2 towards which it has some silver markings on it; a silver terminal band from below apex to vein 2 with some yellow before it, cilia yellow with brown tips from apex to vein 2, then pale.

Habitat.—CEYLON, Maskeliya (Alston). *Exp.* 26 mill. Type in B. M.

Genus CENOLOBA.

Cenoloba, Wlsm. Ent. Mo. Mag. xxi, p. 175 (1885).

Type *C. obliterata*, Wlk., from Australia.

Proboscis fully developed; palpi porrect, typically extending about three times length of head and with the 3rd joint porrect, the 2nd joint fringed with hair below produced to a point at extremity, the 3rd naked; maxillary palpi about half the length of labial palpi, typically triangularly scaled; frons rounded; antennae minutely serrate and ciliated. Forewing elongate, narrow, the termen deeply cleft to one half, the segments lanceolate; vein 1 simple; 2 and 3 stalked; 4 from angle of cell; 5, 6 obsolete; 7 from upper angle; 8, 9, 10, 11 stalked. Hindwing elongate and gradually dilated, the termen deeply cleft, the segments lanceolate; vein 2 from before angle of cell; 3, 4 stalked from angle; 5 to base of cleft from middle of discocellular; 6, 7 shortly stalked; 8 anastomosing with 7 to three-fourths of wing.

4751d. CENOLOBA TAPROBANA, n. sp.

Palpi about twice the length of head, the 3rd joint set on at an angle; maxillary palpi almost filiform.

White; antennae yellowish; tarsi with brownish rings. Forewing with some dark points on costa; indistinct yellowish antemedial, medial and

postmedial bands from below costa to inner margin; a slight dark discoidal striga on outer edge of the medial band; the extremity of the lower lobe yellowish. Hindwing with antemedial and postmedial yellowish bands, the extremities of the lobes yellowish.

Habitat.—CEYLON, Trincomali (E. E. Green). *Exp.* 10 mill. Type in B. M.

PYRAUSTINÆ.

4768*a*. *MASSEPHA RUFESCENS*, n. sp. (Pl. G., f. 44).

Hindwing with veins 4, 5 strongly stalked.

♀. Head, thorax and abdomen dark-brown mixed with yellowish white the frons and head between antennæ paler; palpi yellowish white, the 1st and 2nd joints banded with brown; legs yellowish white tinged with brown. Forewing reddish brown irrorated with dark brown on inner area; the costa and terminal area pale yellow; antemedial patches of diffused black scales below the cell and vein 1; a discoidal whitish patch with a brown striga on discocellulars; an oblique brown postmedial line defined on outer side by a whitish band. Hindwing red-brown, the basal half irrorated with dark-brown and greyish scales; an indistinct oblique dark discoidal spot; an indistinct sinuous brown postmedial line faintly defined on outer side by greyish; the apex pale yellow; the underside whitish, the costal half suffused with brown, a dark spot in cell near base and prominent discoidal lunule, the postmedial line more distinct.

Habitat.—MADRAS, Nilgiris (Andrewes). *Exp.* 16 mill. Type in B. M.

4783. *REHIMENA PHRYNEALIS*.

Larva. Pale grass-green; skin semi-transparent; somites well-defined; dorsal stripe slightly darker green; a few fine black specks on the head and 2nd somite; ventral surface and legs much paler; head ochreous yellow. Feeds spun up in the leaves of a creeper. (W. H. Campbell.)

4850*a*. *NOSOPHORA MESOSTICTA*, n. sp.

♂. Head and thorax brown, the frons, vertex of head and tegulæ with some whitish; pectus and legs ochreous white with some brown; abdomen brown with white dorsal bar at base, the ventral surface white. Forewing brown; a small white spot in middle of cell and a bar beyond the cell expanding into a rounded patch between veins 4 and 2. Hindwing brown with round white spot beyond the cell.

Habitat.—ASSAM, Khâsis. 1 ♂ type. *Exp.* 28 mill.

4844*a*. *BOCCHORIS ALBINALIS*, n. sp.

Head and thorax pure white, the patagia with rufous point; fore tibiæ with rufous band at extremity; abdomen white dorsally tinged with rufous. Forewing pure white; a subbasal rufous striga from costa and slight curved mark above inner margin; antemedial line double, rufous, oblique and sinuous; medial line double, rufous, enclosing a rufous discoidal

striga, the inner line incurved and the outer line excurved below the cell; postmedial line rufous, double towards costa, excurved to vein 3, then incurved; subterminal line rufous, incurved, from costa to vein 3, a rufous terminal line; cilia with a slight rufous line at middle. Hindwing semi-hyaline white; a double rufous medial line arising below costa, obliquely curved and enclosing a white discoidal bar; postmedial line rufous, slightly excurved at vein 5 and ending at vein 2 on the sinuous rufous subterminal band; a rufous terminal line and fine rufous line near base of cilia.

The Muscat specimen has the subterminal line of forewing continued to inner margin and closely approximated to the postmedial line; the postmedial line of hindwing double, the line through the cilia of both wings stronger and the cilia of forewing tinged with rufous at apex and middle.

Habitat.—ARABIA, Muscat (Jayaker); BOMBAY, Kutch (Swinhoe). *Exp.* 18-20 mill. Type in B. M.

4878a. *PHRYGANODES STYGIALIS*, n. sp.

Abdomen of male slightly dilated towards extremity with exsertible dorsal fringe of white hair, the anal segment very long.

♂. Head, thorax and abdomen deep fuscous brown; palpi white at base; pectus, legs and ventral surface of abdomen white, the fore legs fuscous in front, the fore tibiæ and tarsi banded with white. Forewing deep fuscous brown; a minutely waved blackish antemedial line; a small black spot in middle of cell and discoidal lunule; postmedial line black, incurved below costa, bent outwards and minutely dentate between veins 5 and 2, then bent inwards to below end of cell and sinuous to inner margin. Hindwing deep fuscous brown with a slight greyish tinge; postmedial line blackish, oblique and minutely waved from costa to vein 2, then bent inwards and sinuous to inner margin; the underside whitish tinged with brown, a small black discoidal spot, the postmedial line not waved.

Habitat.—CEYLON, Maskeliya (Alston), Haputale (Alston). *Exp.* 30 mill. Type in B. M.

4894a. *DICHOCHOCIS MACROSTIDZA*, n. sp.

Head, thorax and abdomen orange-yellow; tegulæ, shoulders and patagia with black spots; fore coxæ and fore and mid femora blackish the fore tibiæ and the tarsi banded with black; abdomen with dorsal and subdorsal series of black spots, the anal tuft of male black. Forewing orange-yellow; a black spot at base of costa; antemedial black spots at costa, below cell and on inner margin; a black spot in middle of cell and discoidal bar; an oblique postmedial maculate band from costa to discal fold and an incurved series of three spots from below lower angle of cell to inner margin; an oblique series of seven spots from below costa towards apex to inner margin and three subterminal spots between veins 3 and 2. Hindwing orange-yellow; a black discoidal spot and two obliquely

placed spots above middle of inner margin; three obliquely placed post-medial spots from below costa to discal fold, a series of eight spots from below costa towards apex to above tornus, and three subterminal spots between veins 5 and 2.

Habitat.—BURMA, Rangoon (Scott), Khyen Hills (Watson). *Exp.* 28·32 mill. Type in B. M.

4911a. *NACOLEIA PACHYTORNALIS*, n. sp.

Hindwing of male with groove in submedian fold on upperside, the underside with tuft of long pinkish hair from base of inner margin, the inner area forming a large hollowed out vesicle towards tornus, with small curved tuft of hair at middle of vein 1 and fringes of thick scales towards tornus.

♂. Head ochreous; thorax grey suffused with purplish brown; abdomen brownish ochreous; palpi whitish at base and with brown band at middle; pectus and legs white tinged with ochreous. Forewing grey tinged with purplish and irrorated with brown; traces of a sinuous dark antemedial line; a dark discoidal lunule constructed at middle; post-medial line dark, excurved to vein 4, then bent inwards to lower angle of cell and oblique to inner margin; cilia grey and fuscous with a pale line at base. Hindwing brownish grey irrorated with fuscous except on costal area; an ill-defined whitish antemedial band; a dark postmedial line, excurved to vein 4, then bent inwards to lower angle of cell: cilia fuscous with whitish lines at base and middle; the underside yellowish white with indistinct curved dark postmedial line.

Habitat.—MADRAS, Horsleykonda (Campbell). *Exp.* 20 mill. Type in B. M.

4920a. *NACOLEIA OCHRIZONALIS*, n. sp.

Head brown mixed with ochreous; palpi ochreous with blackish band on second joint; thorax cupreous brown; pectus and legs ochreous, the fore tibiae with blackish band; abdomen cupreous brown, the extremity and ventral surface ochreous. Forewing cupreous brown, the costa except towards base and the termen and cilia ochreous; antemedial line rather diffused, oblique from costa to median nervure; a black point in middle of cell and small discoidal lunule; postmedial line rather diffused, blackish, at vein 4 bent inwards to below angle of cell, then erect. Hindwing cupreous brown, the termen and cilia ochreous; a blackish discoidal striga; postmedial line indistinct, blackish, slightly bent outwards between veins 5 and 2, then bent inwards and oblique to above tornus.

Habitat.—SIK HIM (Pilcher); ASSAM, Khásis. *Exp.* 30 mill. Type in B. M.

4928a. *NACOLEIA FUSCIFUSALIS*, n. sp.

Head, thorax and abdomen fulvous yellow mixed with fuscous; palpi black, white at base; pectus, legs and ventral surface of abdomen white,

the fore tibiae with fuscous band. Forewing fulvous yellow irrorated and suffused with fuscous especially on basal area and terminal area except above tornus; antemedial line blackish, bent outwards at median nervure, a small annulus in middle of cell and discoidal lunule defined by blackish; terminal half of costa with short black streaks; postmedial line black, incurved at discal fold, excurved between veins 5 and 2, then retracted to below end of cell and again excurved above inner margin, a blackish patch beyond it above inner margin and the terminal area blackish from apex to vein 3; a terminal series of small black spots; cilia yellow with a black line near base and some fuscous at middle. Hindwing fulvous yellow, the terminal area suffused and irrorated with blackish except a patch below middle; some black at extreme base and a black discoidal spot; postmedial line black, excurved between veins 5 and 2, then retracted to below the discoidal spot and straight to inner margin; a series of black points just before termen: cilia yellow with some fuscous at middle; the underside with the blackish on terminal area confined to apical area.

Habitat.—CEYLON, Rambukkhana (Alston); WOODLARK I. (Meek). *Exp.* 14 mill. Type in B. M.

4928*b*. *NACOLEIA LEUCOSEMALIS*, n. sp.

♂. Head, thorax and abdomen pale yellow mixed with black except on terminal half of abdomen which has a black bar at base of anal segment and lateral series of black points; antennæ ringed with black; pectus, legs and ventral surface of abdomen whitish, the fore tibiae with blackish band. Forewing yellow thickly irrorated with black, the costa and termen less thickly irrorated; a subbasal black striga from costa; antemedial line black, waved; a white spot in middle of cell and narrow discoidal lunule defined by black; postmedial line blackish with black spot at costa, excurved between veins 5 and 2, then retracted to below the discoidal lunule and straight to inner margin; a terminal black line from apex to vein 3. Hindwing yellow thickly irrorated with black except at termen; a small black discoidal spot, sinuous blackish postmedial line, and slight blackish terminal line from apex to vein 3; the underside with the postmedial line excurved between veins 5 and 2.

Habitat.—CEYLON, N. Centr. Province (Pole). *Exp.* 12 mill. Type in B. M. 4942*b*. *NACOLEIA CONISOTA*, n. sp.

♀. Head, thorax and abdomen pale reddish brown, the head and front of thorax tinged with black; palpi white at base; pectus, legs and ventral surface of abdomen pale. Forewing ochreous suffused with reddish brown and irrorated with fuscous, the basal half of costal area blackish; antemedial line dark, excurved in submedian interspace; a black point in middle of cell and two discoidal bars; some black points on medial part of costa; postmedial line black, excurved between veins 5 and 2, then retracted to below end of cell and excurved above inner margin; a

terminal series of blackish points. Hindwing ochreous tinged with red-brown and irrorated with fuscous; a small blackish discoidal spot; post-medial line blackish, excurved between veins 5 and 2, then retracted to below end of cell and oblique to tornus; a terminal series of blackish points.

Habitat.—MADRAS, Nilgiris (Andrewes). *Exp.* 22 mill. Type in B. M.

4942c. *NACOLEIA MEGASPILALIS*, n. sp.

Head and thorax cupreous brown mixed with white; abdomen banded white and cupreous brown. Forewing whitish; the basal area suffused with cupreous brown; an oblique, slightly irregular dark antemedial line; a quadrate cupreous brown spot in middle of cell conjoined to another below the cell; a equadrate cupreous brown patch in and beyond end of cell with small spot above it on costa and another beyond it on costa; postmedial line rather diffused and maculate, oblique from costa to vein 5, bent outwards and somewhat dentate between veins 5 and 2, then retracted to below angle of cell; terminal area suffused with brown and with a white patch between veins 5 and 2 leaving two small wedge-shaped brown spots on termen. Hindwing white; a diffused brown line close to base; a discoidal point; a diffused rather maculate medial line; a diffused rather maculate postmedial line bent outwards and somewhat dentate between veins 5 and 2; teminal area suffused with brown and with white patch between veins 5 and 2 leaving two small wedge-shaped brown spots on termen.

Habitat.—MADRAS, Horsleykonda (Campbell); QUEENSLAND, Dawson Dist. Ranöe (Barnard). *Exp.* 20 mill. Type in B. M.

4983a. *SYLEPTA AGRAPHALIS*, n. sp.

Sylepta denticulata, Hmps. Moths Ind. iv., p. 338 (part).

♂. Head, thorax and abdomen grey-brown, the head whiter; palpi black, white at base and tips; pectus, legs and ventral surface of abdomen whitish. Forewing grey-brown; a slight dark antemedial mark on costa and oblique whitish line defined on outer side by fuscous from cell to inner margin; a small whitish spot at middle of cell and curved discoidal striga both defined by fuscous; postmedial line represented by a small fuscous spot at costa with two small whitish spots below it, then by a series of small fuscous spots with whitish points on their outer side, excurved between veins 5 and 2, then bent inwards to below end of cell and oblique to inner margin; a terminal series of minute blackish points and a fine pale line at base of cilia followed by a dark line. Hindwing grey-brown; an oblique dark discoidal striga; a slight dark postmedial line defined on outer side by whitish, bent outwards between veins 5 and 2, then retracted and oblique to above tornus; a terminal series of blackish stræ and fine pale line at base of cilia.

Habitat.—BHUTAN (Dudgeon); ASSAM, Khâsis. *Exp.* 32 mill. Type in B. M.

4989a.—*SYLEPTA MICROSEMA*, n. sp.

♂. Head and thorax dull greyish brown; palpi fuscous, white at base, abdomen pale brown; pectus, legs and ventral surface of abdomen white, the fore tibiæ with slight fuscous band. Forewing brown with a slight cupreous tinge; antemedial line indistinct, dark, oblique, from costa to median nervure, then more erect; a pale point in middle of cell and slight whitish discoidal lunule both defined by dark-brown; postmedial line dark-brown, slightly incurved below costa and oblique to vein 2, then retracted to below end of cell and excurved at vein 1. Hindwing brown with a slight cupreous gloss; a faint dark discoidal bar; postmedial line very indistinct, dark, slightly excurved between veins 5 and 2, then retracted to below end of cell and oblique to above tornus; the underside brownish white.

Habitat.—CEYLON, Puttalam (Pole); SINGAPORE (Ridley); LOUISIADES, St. Aignan (Meck). *Exp.* 28 mill. Type in B. M.

4990. *SYLEPTA ADDUCTALIS*.

Larva.—Attenuated at extremities, the divisions of somites strongly marked, dull pinkish green; head small, dull green. Feeds spun up in the leaves of *Elsam*. (W. H. Campbell.)

4994. *SYLEPTA PSEUDOVIALIS*, n. sp.

Sylepta ovalis, Hmps. Moths Ind. iv, p. 340 (nec. Wlk.)

Head, thorax and abdomen fuscous brown with a slight cupreous gloss; palpi black-brown, white at base; pectus, legs and ventral surface of abdomen white, the fore tibiæ with fuscous band at extremity and the tarsi tinged with fuscous above. Forewing fuscous brown with a slight cupreous gloss; traces of a whitish antemedial line from cell to inner margin with a more or less distinct spot beyond it in cell; a quadrate white spot in end of cell; postmedial line forming an elliptical white spot from below costa to vein 5 where it is very slightly bent outwards, then slight, whitish, at vein 2 bent inwards to below end of cell, then more distinct and slightly excurved. Hindwing fuscous brown with a cupreous gloss; a faint dark discoidal lunule; postmedial line with small white spot below costa, then slight, whitish and bent outwards between veins 5 and 2, then bent inwards to below end of cell and more distinct and oblique to above tornus; cilia with a fine white line at base; the underside with the basal and inner areas whitish, a dark point in middle of cell and discoidal lunule, the postmedial line more distinct.

Habitat.—SIKKIM (Dudgeon, Pilcher); BHUTAN (Dudgeon); ASSAM, KHÁSIS; CEYLON (Green); BORNEO, Sarawak (Shelford), Pulo Laut (Doherty). *Exp.* 30 mill. Type in B. M.

5008a. *GLYPHODES CAPRINIODES*, n. sp.

Head, tegulæ and shoulders fulvous brown, the rest of thorax white; palpi white at base and in front; pectus, legs and abdomen white; the fore tibiæ fulvous. Forewing semihyaline white, the costal area fulvous

brown indented by a slight white striga at discocellulars; a series of fuscous striæ just before termen. Hindwing semihyaline white with a fine fuscous line just before termen.

Habitat.—PUNJAB, Manpuri; BOMBAY, Ratnagiri (Jayaker); BURMA, Tenasserim, Donaut Hills, (De Nicéville); ANDAMANS. *Exp.* 36-40 mill. Type in B. M.

5010a. GLYPHODES ATHYSANOTA, n. sp.

♂. Yellow-green; palpi fulvous, white at base, and at tips of maxillary palpi; frons fulvous and white at sides; antennæ with the tuft before the excision yellow at tip; shoulders with fulvous streaks; pectus and ventral surface of abdomen white; the fore tibiæ banded with fulvous, the mid tibiæ streaked with fulvous above at base; anal tuft fuscous and white. Forewing with the costa reddish brown; a black discoidal point; cilia reddish brown, white at tips. Hindwing with the costal and inner areas white; cilia red-brown, white at tips from apex to vein 2, then wholly white.

Habitat.—MADRAS, Nilgiris (Andrewes); BR. N. GUINEA, Mafalu (Pratt), McKebea (Pratt). *Exp.* 30 mill. Type in B. M.

5184b. NOORDA MARGARONIALIS, n. sp.

♂. Head, thorax and abdomen pale yellow-green; palpi at tips and lower part of frons white; pectus and legs white; anal tuft fuscous. Forewing pale yellow-green, the costal edge white; cilia white at tips. Hindwing semihyaline white tinged with green; the underside with the costal area green.

Habitat.—PUNJAB, Kangra Valley, 4,500 feet (Dudgeon) 1 ♂. *Exp.* 20 mill. Type in B. M.

5196b. CALAMOCHROUS BIPUNCTALIS, n. sp.

♂. Head, thorax and abdomen pale ochreous yellow mixed with whitish; palpi white at base, brownish at tips; fore femora and tibiæ tinged with brown. Forewing pale ochreous yellow, the costal and inner areas tinged with brown; two obliquely placed blackish points in middle of cell; an oblique dark antemedial striga from vein 1 to inner margin; a diffused brownish discoidal lunule; the median nervure and base of veins arising from it slightly streaked with brown; a diffused brown mark beyond the cell with oblique fascia from it to apex; short dark postmedial streaks in the interspaces from vein 6 to below vein 2. Hindwing pale ochreous yellow.

Habitat.—MADRAS, Palnis (Campbell). *Exp.* 34 mill. Type in B. M.

5236b. PYRAUSTA METASIALIS, n. sp.

♂. Head, thorax and abdomen ochreous white irrorated with fuscous; palpi below, pectus and legs whitish, the fore tibiæ with black band at extremity. Forewing ochreous white thickly irrorated with fuscous; the costal edge blackish towards base; a curved blackish antemedial line;

an obscure blackish annulus in middle of cell and discoidal lunule defined by blackish; postmedial line blackish, oblique to discal fold, bent outwards between veins 4 and 2, then retracted to below end of cell and erect to inner margin. Hindwing ochreous white thickly irrorated with fuscous; a rather diffused oblique blackish antemedial line; postmedial line blackish, incurved at discal fold, then excurved and diffused to tornus; some fuscous suffusion before termen towards apex.

Habitat.—SIK HIM (F. Möller). *Exp.* 14 mill. Type in B. M.

5255*b*. PYRAUSTA MICRODONTALIS, n. sp.

Head, thorax and abdomen white faintly tinged with reddish brown, the head and base of tegulæ rather more strongly tinged; palpi white below and blackish above; abdomen with subdorsal black points on 3rd segment; fore tibiæ with black band at extremity. Forewing white tinged with reddish brown and slightly irrorated with fuscous; antemedial line blackish, oblique from costa to submedian fold; black points at middle of cell and on discocellulars; postmedial line formed of small dentate black marks, excurved between veins 5 and 2, then bent inwards; a terminal series of slight blackish striæ. Hindwing white tinged with reddish brown and slightly irrorated with fuscous; a black discoidal point; postmedial line black, minutely dentate, bent outwards between veins 5 and 2; a terminal series of slight black striæ.

Habitat.—CEYLON, Maskeliya (Alston). *Exp.* 40 mill. Type in B. M.

5259*a*. PYRAUSTA MONOSEMA, n. sp.

Head, thorax and abdomen red-brown; pectus, femora and ventral surface of abdomen fuscous; antennæ tinged with fuscous. Forewing red-brown; a blackish discoidal bar; postmedial line blackish, bent outwards at vein 6, then minutely waved, excurved to vein 4, then oblique. Hindwing pale reddish brown; the underside with indistinct curved postmedial line.

Habitat.—PUNJAB, Lahore. (Mrs. Mulvany). *Exp.* 28 mill. Type in B. M.

ADDENDA.

SPHINGIDÆ.

91*f*. MARUMBA BENGALENSIS, n. sp.

♂. Head, thorax and abdomen pale red-brown tinged with grey, the dorsum of thorax with darker stripe; frons dark red-brown at sides. Forewing pale red-brown tinged with grey; an oblique slightly incurved antemedial line; two medial lines; some dark suffusion on inner medial area; a pale elliptical discoidal spot defined by fuscous and extending to well below the cell; a dark line just beyond the cell, oblique below vein 4; postmedial line dark, incurved to below vein 4 where it is hooked, then strongly retracted and incurved; a large chocolate brown patch on terminal area from costa to below vein 4, with incurved inner edge

and two conjoined obliquely placed spots from below vein 3 to tornus. Hindwing ochreous tinged with rufous; a lunulate chocolate-brown patch before termen from vein 3 to tornus; the underside with two red-brown antemedial lines and two postmedial lines oblique from costa to between veins 3 and 4, then incurved.

Habitat.—BENGAL, Chota Nagpur, Kalunga. *Exp.* 60 mill. Type in B. M.

NOTODONTIDÆ.

221c. PHALERA DIVERSA, n. sp.

Antennæ of male bipectinate to two-thirds length.

♂. Head and thorax dark-brown mixed with grey especially on patagia and metathorax; abdomen dark-brown, the ventral surface with grey mixed. Forewing dark-brown with grey mixed; an oblique sinuous black subbasal line and erect sinuous medial line; a narrow white discoidal lunule; some white irroration on postmedial part of costa; postmedial line black, arising below costa, sinuous, incurved below the cell where there is some brownish grey before it and bent outwards between veins 4, 3; a dentate blackish subterminal line arising from apex towards which it is oblique and diffused, incurved between veins 6 and 4, where there is a brownish grey patch beyond it followed by slight black streaks on the veins, then indistinct, dentate and slightly defined on outer side by brownish grey; a crenulate blackish terminal line. Hindwing dark reddish brown, the cilia whitish at tips; the underside with rather diffused postmedial line and the terminal area slightly irrorated with grey.

♀. Forewing suffused with pure white to postmedial line except on inner area, some white on terminal area below apex.

Habitat.—BOMBAY, Kanara, Karwar. *Exp.* ♂ 56, ♀ 76 mill. Type in B. M.

265a. STAUIOPUS CHLOROTRICA, n. sp.

♂. Head and thorax dark-brown mixed with grey-white; palpi black-brown, whitish in front; pectus and legs whitish tinged with red-brown, the tarsi ringed with red-brown; abdomen dark-brown, the basal crests with a few whitish scales, the ventral surface whitish suffused with red-brown. Forewing dark reddish brown overlaid with golden-green hair-like scales; faint braces of wavy dark antemedial, postmedial and subterminal lines. Hindwing dark red-brown, the apical part of costal area overlaid with golden-green hair-like scales and with a paler green bar just before apex; the underside white faintly tinged with red-brown.

Habitat.—SIKIM (F. Möller). *Exp.* 44 mill. Type in B. M.

DREPANIDÆ.

706a. LEUCODREPANA FURVICOSTA, n. sp.

Head, thorax and abdomen pure white; palpi, frons and antennæ

fulvous; forelegs brownish in front. Forewing pure white, the costal edge fulvous; traces of two oblique waved lines formed of blackish scales from below middle of costa to inner margin and of two similar subterminal lines, and of a line just before termen. Hindwing pure white with traces of a waved antemedial line formed of dark scales, of two similar postmedial lines, and of a line just before termen.

Habitat.—SIK HIM TIBET, Yatung (Hobson); SIK HIM (F. Möller). *Exp.* 30 mill. Type in B. M.

720a. *DREPANA BICOSTATA*, n. sp.

♂. Head blackish; thorax pale violaceous brown; pectus and legs greyish ochreous, the forelegs tinged with brown; abdomen greyish, the ventral surface ochreous white. Forewing pale violaceous brown; antemedial and postmedial red-brown patches on costa, the former with slightly incurved fulvous line from it to inner margin; an oblique fulvous subterminal line; the costal area towards apex, the termen and cilia to vein 3 suffused with red-brown. Hindwing ochreous yellow, the inner area greyish with a fulvous postmedial bar; the underside with some greyish on costal area beyond middle and a slight postmedial bar.

Habitat.—SIK HIM (F. Möller). *Exp.* 23 mill. Type in B. M.

(To be continued.)



A



B



C



D

A.—*Russula Theissenii*.

B.—*Armillaria mellea*.

C.—*Marasmius subrhodocephalus*.

D.—*Favolus ciliaris*.

THE FUNGI OF INDIA

BY

F. THEISSEN, S. J.

PART I.

(With Plates I to IV and text figures 1 to 10.)

The fungal flora of India, especially of the Bombay Presidency, has received very little attention up to now. Whilst collections on a larger scale were made in Ceylon, Australia, and New Zealand, we possess, with regard to the Indian mycoflora, but short notices which appeared at great intervals in the scientific journals of the last forty years. It was only during the last ten years that larger collections were made by Mr. W. Gollan, the Superintendent of the Royal Botanic Gardens at Saharanpur, the Rev. E. Blatter, Professor of Botany at St. Xavier's College in Bombay, and quite recently by the Imperial Mycologist, Mr. E. J. Butler, whose extensive materials have been described by Messrs. H. and P. Sydow in the *Annales Mycologici* of 1906, 1907 and 1911.

It is not difficult to understand, why the Indian mycoflora has been so much neglected in the past. As it happens very rarely that scientific expeditions, composed of specialists, select India as the field of their explorations, mycologists in Europe have to depend entirely on the good-will and the initiative of amateurs. Much has already been done in this respect by Europeans residing in India, but we feel convinced that many more would be willing to contribute towards the exploration of that vast and interesting country, if they knew how to gather and prepare specimens. We trust, therefore, that a few practical hints for collectors will be welcome.

As to the literature on Indian fungi, we refer to the 'Bibliography of the Botany of British India and Ceylon' by E. Blatter, which appeared in Vol. XX, No. 5 of this Journal, p. lxxix—clxxxv.

I

A FEW HINTS FOR COLLECTORS.

1. How to distinguish fungi.

Fungi may easily be distinguished from other cryptogamic

plants, such as lichens and algæ, by the absence of the green colouring matter, called chlorophyll. It is for this reason that they assume all possible colours, except green. Being devoid of chlorophyll they cannot assimilate carbon dioxide, but must take up their carbonaceous food in the form of rather complex compounds, which they find on living or dead organic substances *v. g.* leaves, wood, dung, humus, decayed fruits, paper, insects, etc. Accordingly, some are parasitic, such as the Rusts and Smuts, and absorb those complex carbon-compounds from other living organisms, whether plants or animals. Others are saprophytic, absorbing those compounds from the remains of dead organisms as, *v. g.* the numerous and often large mushrooms which grow on humus or leaf soil in forests,—or from organic substance formed by living organisms. Examples of the latter are the Yeasts and Moulds which make their appearance on juicy fruits, saccharine liquids, etc.

This is not the place to give a systematic account of the different classes of fungi. We shall confine ourselves to giving the general characteristics of some more important groups.

Excluding from the outset the Schizomycetes (*v. g.*, Bacilli), Myxomycetes and Phycomycetes, we shall consider the fungi known as Mushrooms, Toadstools, Puffballs, Yeast, Moulds, Mildews, Rusts and Smuts.

These may be divided into two classes, the Basidiomycetes and Ascomycetes. In the Basidiomycetes the spores are borne free on so-called basidia (Fig. 1), whilst in the Ascomycetes the spores,

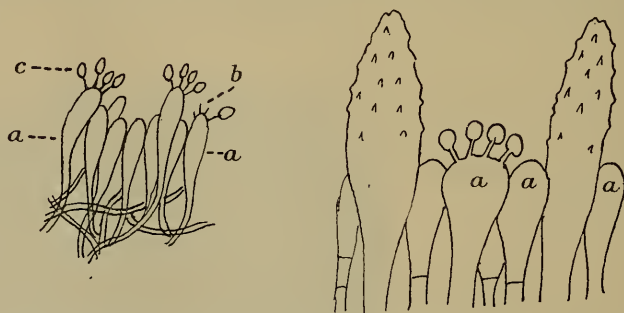


FIG. 1.—Section of a gill of an Agaric (left) and of a pore of a Polyporus (right), showing the basidia (a) which bear on 4 sterigmata (b) the 4 spores (c).

usually 8 in number, are included in a sack, called ascus (Fig. 2).

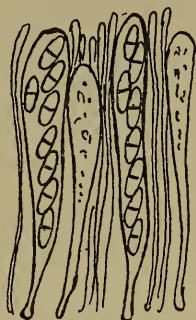


FIG. 2.—Section of the hymenium of an Ascomyces, showing the asci with 8 bicellular spores.

A.—BASIDIOMYCETES.

Omitting for a moment the Uredinales (Rusts, Smuts), we divide the Basidiomycetes into two very natural orders; the Hymenomycetes and Gastromycetes.

In the Hymenomycetes (*v. g.*, the common Mushroom) the basidia with the spores are exposed and free from the beginning, or at least from a very early state. In the Gastromycetes the basidia are developed in cavities within the tissue of the plant (Puff-Balls for instance).

Hand in hand with this internal anatomical structure, the various families show distinct outer morphological characters. In order to distinguish them it is, therefore, not necessary, to make a minute microscopical examination.

I.—*Hymenomycetes*.

1. **Agaricaceæ**.—Agarics, the common Mushroom. (Plate I, A, B, C).*

* Figures A, B, D of Pl. I, A of Pl. III, from Rick. *Contributio ad Monogr. Agar. et Polyp.* Broteria, 1907.

Fig. C of Pl. I. Theissen, *Marasmii austro-brasilienses*, Broteria, 1909.

„ of Pl. II. „ *Polyporaceæ austro-brasilienses*, Denkschr. Acad. Wien, 1911.

„ B of Pl. III. Lloyd, *Hexagona*.

„ A, D of Pl. V and A of Pl. VI. Lloyd, *Phalloids*.

Usually fleshy, somewhat umbrella-shaped, when stalked, or fan-shaped when sessile. Consists generally of a stalk, termed the stipe, bearing at its apex a large circular expansion, the pileus (hat). On the underside of the pileus are a number of radiating plates of tissue (lamellæ) on which are developed the microscopic basidia. Pileus and stalk vary much as regards size, shape, consistency and colour.

Habitat.—On the ground, amongst moss, on trunks, rotten wood, dead leaves.

Collectors ought to take notes regarding the following points:—Whether the pileus is furrowed or even, viscid or dry, convex or plane, umbonate in the centre or depressed, pubescent or scaly or smooth, ciliated on the margin, of what colour and size; whether the stalk is viscid, hairy, striped; colour of the lamellæ.

2. **Polyporaceæ.**—(poly=many, porus=pore, hole). The Dry Rot of timber is caused by members of this family. (Plate I, D; Plate II; Plate III, A, B; Plate IV, A.)

Plants of all possible shapes; fleshy, cartilaginous, or tough like wood, forming thin crusts, shapeless lumps, or umbrella-shaped like Agarics, or with the stalk-less pileus reflexed. They differ, however, from the Agarics by bearing the basidia not on radiating lamellæ, but in alveolar (honey-comb-like) pits or tubes.

Habitat.—On rotten wood, branches, stumps (seldom on living trees), or on the ground.

Characters to be noted.—Colour of pileus and tubes; surface even or striped.

* (*contd.*)

Fig. 3 and D of Pl. VI. Grevillea, I.

„ B, C of Pl. VI. Durand, Geoglossaceæ, Ann. Mycol., 1908.

„ 7 and C of Pl. VII. Theissen, Fragm. brasil. Ann. Mycol., 1909.

„ A of Pl. VIII. Theissen, Hypocreaceæ bras., Ann. Mycol., 1911.

„ A, B of Pl. VII. Starbäck, Ascom. R. Exped.

„ C of Pl. VIII and Pl. IX. Theissen, Xylariaceæ bras., Denkschr. Acad. Wien, 1910.

„ 6, 9, 10. After Spegazzini, Mycet. Arg. IV.

3. **Hydnaceæ**.—Like the preceding, but more rarely stalked, usually resupinate (expanded) or forming a reflexed pileus. Basidia on spinous projections or teeth, which cover the under surface of the pileus, or the upper when the fungus is resupinate (Plate IV, B).

Habitat, etc., as in No. 2.

4. **Clavariaceæ** (clava=club).—In this family the special organs for the support of the basidia (like lamellæ, tubes, teeth) disappear. The basidia cover the whole surface or are limited to the upper part. The fungus is either unbranched, forming simple club-shaped bodies, or densely branched, cylindrical, or flattened and expanded, but not differentiated into stalk and pileus, cartilaginous. (Plate IV, C.)

Habitat.—On the ground or on bark.

Characters to be noted.—Colour, pubescence.

5. **Telephoraceæ**.—Light yellow, reddish or brown crusts, ear-shaped pileus, seldom stalked. Basidia equally distributed over the even smooth light-coloured surface.

Habitat.—On wood.

Characters to be noted.—Colour.

II.—*Gastromyces*.

In characterizing the families of this order we follow C. G. Lloyd's excellent monograph.

1. **Phalloideæ**.—(Plate V, A, B, C.)

Plants fleshy, enclosed in a gelatinous volva when young (eggs); when mature, they bear at the top a mucilaginous mass which contains the spores.

Phalloids are known for their foetid smell and bizarre shape. They attract the attention of the most unobserving, and are often given very appropriate names like: Stinkhorn, Stinkballs, Dead Man's Finger.

Only three colours have been observed in Phalloids: red, yellow,

and white. Most of them are red or some shade of red, pink flesh-coloured, orange.

2. **Nidulariaceæ**.—Nest Fungi, Bird's Nests. (Plate VI, A.)

Plants shaped like little cups which open at the top and contain a number of small seed-like bodies, "eggs" (sporangia).

3. **Lycoperdaceæ**.—Puff-Balls.

The ripe peridium consists of two distinct membranes (exoperidium and endoperidium), enclosing a powdery mass (spores).

(a) *Geastræ*. Star Puff-Ball.—(Fig. 3).—Outer membrane thick, splitting into recurving segments.

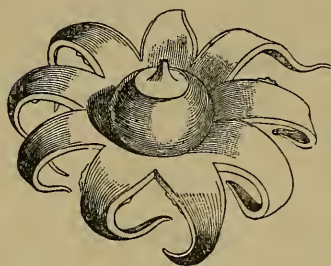


Fig. 3.—*Geaster saccatus*.

away in pieces.

(b) *Bovistæ*. Tumblers.—Outer membrane thin, not splitting into radiating segments.

(c) *Lycoperdæ*. True Puff-Balls.—(Plate V, D.)—Peridium flaccid, opening by a definite mouth, or rupturing irregularly and falling

III.—*Uredinales*.

This order comprises those parasites which are generally known as Rusts, on account of the rusty appearance they give to their host-plants at a certain stage of their development.

They may be distinguished with the naked eye as minute roundish or oblong brown (yellowish or black) spots ('sori') on the leaves, or even as compact bullate pustules some mm in diameter, scattered or crowded, often hidden by the pubescence of the leaf. The surrounding tissue is often killed by the parasite, assuming the appearance of round reddish-brown or pale spots.

B.—ASCOMYCETES.

This class includes a vast number of forms. We shall mention only a few typical representatives of the chief families. Some of them, the Discomycetes, have the 'asci' (spore-sacks) disposed on a continuous plain or disc, whilst others, the Pyrenomycetes, have them enclosed in capsules or receptacles, called 'perithecia.'



Ganoderma formosissimum.

I.—*Discomycetes*. (Plate VI, B, C, D and fig. 4.)FIG. 4.—*Sarcosoma* Möelleri.

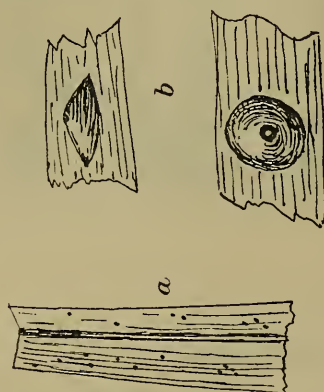
Light-coloured small cups or bowls from 1 mm to several cm in diameter, or upright ears, or finally with a distinct stalk. The asci with the spores are not included in receptacles, but distributed over the whole fertile, mostly coloured surface.

In the family *Geoglossaceæ* this surface does not present the usual cup-shaped form, but reminds one of the club-shaped body of *Xylarias*.

Characters to be noted.—Colour, dimensions, pubescence.

II.—*Pyrenomycetes*.1. **Perisporiales and Microthyriales.** (Fig. 5, 6 and Plate VII, A.)

FIG. 5.—Single threads and young perithecia of an *Asterina* (enlarged).

FIG. 6.—*Vizella* Urvilleana.

a. natural size.

b. two perithecia enlarged.

A very interesting group, mostly leaf-fungi, growing on living and fading leaves of phanerogamic plants. The minute receptacles would escape the eye of the fungus-hunter, if they were not, as is usually the case, crowded together in a black araneous spot of densely interwoven threads.

2. **Hypocreales.**

The representatives of this family appear in all shapes of the Sphæriales (*vide* No. 4 below): clubs, pustules, diffuse thin crusts, and isolated minute scattered perithecia; but they differ by the light-coloured (white, yellowish, reddish), soft (almost fleshy) bodies, the perithecia appearing on the surface as crowded dark minute points.

The most striking species are those growing on insects and their larvæ and chrysalids. (Plate VIII, A.)

3. **Dothideales.** (Plate VII, B.)

Mostly leaf-fungi, forming shining carbonaceous circles or stripes. On branches, they produce pustulate rough black tumours, which are easily recognized.



Fig 7.—*Poronia oedipus*.



Fig. 8.—Section of the club of a *Xylaria* showing the small dark receptacles (perithecia).

4. **Sphæriales.**

The most common forms are the following:—

- (a) Receptacles (perithecia) crowded and immersed in a compact, solid carbonaceous vegetative 'stroma', black

on the outer side, forming club-shaped bodies, bullate pustules, or dark flat crusts. (Plate VII, C, VIII, B, C, IX and fig. 7 and 8.)

- (b) Receptacles single or scattered, minute, superficial, and attracting the attention only when closely grouped together, or immersed in the bark, piercing the epidermis with their tips. (Fig. 9 and 10.)

In this case their presence may be noticed by dark punctiform holes in the epidermis or by the removal of the epidermis, when the black deformation produced in the cambium will at once be apparent.

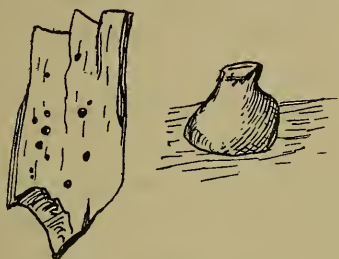


FIG. 9.—*Lophiostigma xerophilum*.

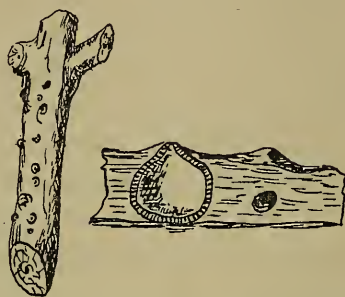


FIG. 10.—*Oraniella coffeicola*; natural size (left) and section (right; enlarged).

2. *How to gather and preserve fungi.*

GENERAL.

1. Take your notes from fresh specimens, before the fungus begins to shrivel up. As to what notes are required, see above.

2. Add the name of the locality, and of the collector, the date (rainy season or not, etc.); mention the substratum of the fungus, whether branches, stumps, leaves, ground. As to the leaf-fungi it is almost indispensable to know the host-plant.

3. Pick up as ample material as possible. There will be more chances in this case, that your material will contain not only half-developed or abnormal specimens without fructification, but also ripe and typical ones. As the various stages of development are of interest to the specialist, it will be good to gather young and old specimens.

4. Do not break or cut off the fungus, but dig or cut it out along with its substratum. This will enable mycologists to study the method of insertion.

5. Specimens of different localities or hosts should be kept separately, even if the fungi seem to belong to the same species.

SPECIAL.

1. Leaf-fungi do not require much preparation. The leaves may be put between sheets of newspaper and pressed and dried in the ordinary way. Do not forget the name of the host-plant.

2. Fungi of hard (woody or carbonaceous) consistency should be dried in the open air. Keep them in a dry well-aired room for two or three days. This simple way of preparing specimens will always do for Thelephoraceæ, Clavariaceæ, Gastromycetes, Discomycetes and Hypocreales.

If enveloped in paper or kept in boxes before thoroughly dry, the specimens will be attacked and spoilt by moulds.

3. Big specimens of Polyporaceæ should be treated in the same manner. It often happens that fine specimens are packed and sent to Europe, but on their arrival nothing is to be found but a powdery mass. The fungus has become a prey of insects.

The practical instruction given by C. G. Lloyd in his 'Mycol. Notes, p. 36,' might be useful in this connection :—

“The principal trouble that many have in making collections of fungi is that specimens are apt to be eaten by insects. This is very discouraging, but we have learned now how to avoid it in a very simple manner. In the old collections where specimens are pasted on sheets they have to be poisoned with a solution of corrosive sublimate and alcohol, but this is very objectionable from the fact that it changes materially the condition of the specimens and they are not in their natural condition after going through the poisoning process. It was formerly my custom when I received specimens to submit them to the fumes of carbon bisulphide, which is fatal to insect life, but I have found that while it may kill the insects in the specimens it does not kill the chrysalis, and specimens

submitted to the fumes may have chrysalides which will hatch out and eventually destroy the specimen. I learned from Mr. Romell of Stockholm a very simple process which is as inexpensive as it is effectual for specimens that are preserved in boxes, but of course does not apply to specimens pasted on sheets. Simply put in each box a liberal quantity of flake naphthalene. For boxes the size of No. $\frac{1}{2}$ and No. 1 a teaspoonful, and for larger boxes a larger quantity in proportion. Flake naphthalene does not affect the specimens at all, but it kills the insects, not only those that may be in the plant, but those that develop afterwards. I have recently gone through our private collection of some ten thousand specimens or more and dumped into each box a sufficient quantity of this flake naphthalene. I do not anticipate there will ever be any trouble in future with insects in my collection. Flake naphthalene is comparatively inexpensive, and two or three pounds will take care of two or three hundred specimens. It costs about fifteen cents per pound."

4. As to the fleshy slender Agarics which always cause great difficulties, there are a good many species which may be treated as mentioned under No. 2. We have adopted this method with success in numerous cases, even with those species which have delicate cartilaginous stalks like *Marasmius* (cf. Fig. 6). But a great number of the fleshy Agarics resist any attempt to dry them. There are even some (*Coprinus*, etc.), which regularly melt into a black gelatinous mass as soon as they are ripe. These must be preserved in tubes filled with alcohol.

5. Of the *Hymenomycetes* spores should be procured. For this purpose fresh specimens must be put on a slide, or a piece of window-glass, or dark paper in such a way that the lamellæ (in Agarics) or tubes (in Polyporeæ) or teeth (in Hydnaceæ) or the smooth surface (in Telephoraceæ) look towards the glass or paper. After a few hours the spores will fall away, covering the glass with a fine layer of white or reddish powder. The glass or paper should then be wrapped up in paper and packed together with the dried specimen. Care must be taken not to mix up the corresponding powders and specimens.

II

LIST OF FUNGI.

NOTE.—The area dealt with comprises British India, including Burma. Baluchistan, Ceylon, the Andaman and Nicobar Islands have not been considered.

Our present article does not include the Uredinales, Phycomycetes, Fungi imperfecti and Myxomycetes.

Many species, specially the older ones, require a critical revision. It is evident from this that much of our list is only of provisional value. As to more recent critical publications we made use of C. G. Lloyd's 'Gastromyceten' and 'Polyporaceen,' and our own investigations on Microthyriaceæ, Perisporiales, and Xylariaceæ.

A.—ASCOMYCETES.

1.—PERISPORIALES.

Sphærotheca pannosa, (Wallr.) Lév. Syll. I, p. 3.

Locality unknown. Known from Europe and N. America.

Erysiphe communis, (Wallr.) Fr. Syll. I, p. 18.

„ **Martii**, Lév. Grevillea VI, p. 117.

Simla, on leaves of *Populus ciliata*, Wall.

Eurotium herbariorum, Link-Syll. I, p. 26.

Bengal, Chittagong, Burma; common on various substances. (Cooke Grevill. IV, p. 117.)

Balladyna Butleri, Syd. p. 388.

On leaves of *Bambusa*, Khasi Hills.

Limacinula Butleri, Syd. p. 385.

On leaves of *Artocarpus mysorensis*, Vayitri, Wynaad.

Limacinula Theæ, Syd. et Butl., p. 386.

On leaves and branches of *Camellia Theæ*, Rungmook, Darjeeling.

Capnodium mangiferum, C. et Br. Syll. I, p. 77.

Syn.: *Dimerosporium mangiferum*, (Cooke) Sacc. l. cit., p. 53.

On leaves of *Mangifera indica*, Mysore.

Capnodium lanosum, Cke. Grevill. VIII, p. 96.

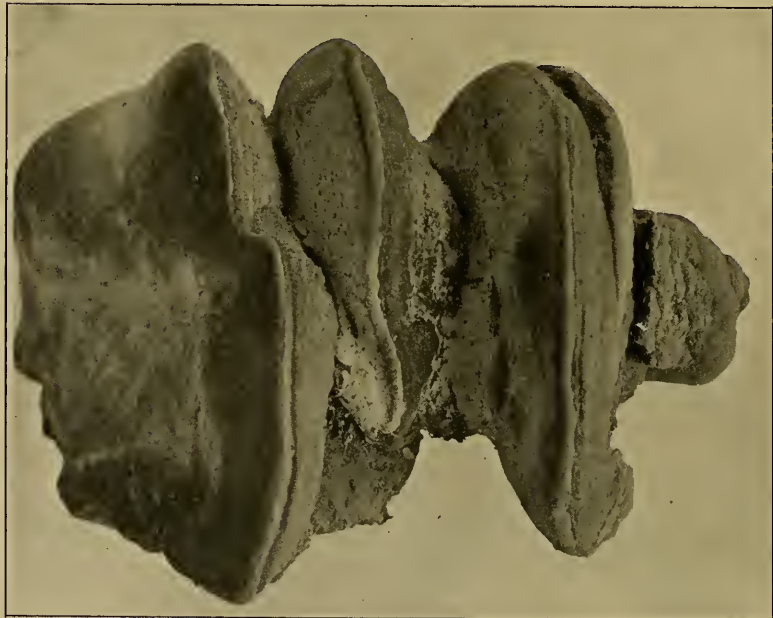
On leaves of *Ficus*, Belgaum.

Capnodium Eugeniæ, Cke. l. cit.

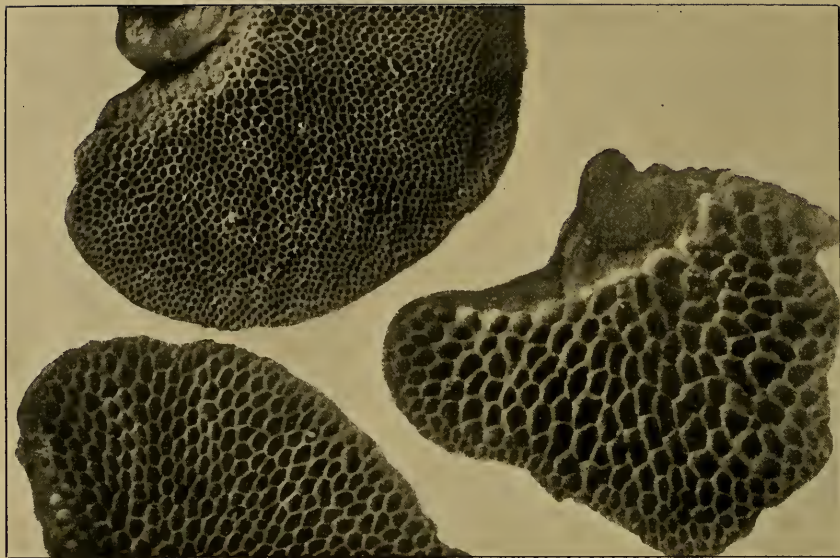
On leaves of *Jambosa vulgaris*, Belgaum.

Capnodium Anonæ, Pat.—Syd., p. 384.

On leaves and branches of *Ficus retusa*, *Agave Vera-Cruz*, etc. Bilikere, Mysore; on *Ficus glomerata*, *retusa*, *bengalensis*, Hassan, Mysore.



A.—*Fomes homodermus*.



B.—*Hexagona Pobeguini*.

This species was originally described from the Gambier Islands, Polynesia (Syll. XVII., p. 555).

Capnodium betle, Syd., p. 384.

On leaves of *Piper betle*, Dacca; Mudon, Amherst District, Burma.

Capnodium brasiliense, Putt.—Syd. l. cit.

On leaves and branches of, *Coffea arabica*, Tuttapullum, Nilgiris.

Parodiella perisporioides, (B. et. C.) Speg.

On leaves of some leguminous plant, Bombay (Cooke in Grevill. IV., p. 117); on cultivated (imported!) *Medicago lupulina*, Dehra Dun; on *Desmodium rufescens*, Wahjain, Assam; on *Indigofera trifoliata*, Kistna District, Madras (Syd., p. 383). The species occurs throughout the tropics.

Lasiobotrys Lonicerae, Kze. Syd., p. 384

On leaves and branches of *Lonicera*, Harwan, Kashmir; on leaves of *Lonicera*, Bhowali, Naini.

Acanthostoma Wattii, (Syd.) Theiss.

Syn. *Dimerium Wattii*, Syd., p. 383. (cfr. Theissen, Zur Revision d. G. Dimerosporium, Beih. Bot. Centr. Blatt 1912). On leaves of *Camellia Thea*, Dunmur Dullung, Sibsagar District, Assam; Darjeeling.

[**Dimerosporium Fumago**, (Niessl.) Sacc.]

Syn. *Meliola Fumago*, Niessl.

On leaves of *Celastrus*, Calcutta.

This species is *Asterina crustosa* (cfr. Theissen, Fragmenta brasiliica VI. in Ann. myc. 1912).

[**Dimerosporium aterrimum**, Cke. et Wint. Grevill. XX, p. 83.]

On coriaceous leaves, Manipur.

Species imperfectly known (cfr. Theissen, l. cit.).

Dimerosporium erysiphoides, Earle.

On leaves of *Cynodon dactylon*, Pusa; on *Paspalum scrobiculatum*, Bassein, Bombay Presidency. (Syd. p. 383).

Meliola zig-zag, B. et Br.

Grevill. VIII, p. 96, Belgaum; Syd., p. 383, on *Cinnamomum*, Wahjain, Assam.

Meliola densa, Cooke, Grevill. XII, p. 85.

On leaves of *Ilex* (?) Khasia.

Meliola amphitricha, Fr.

Grevill. VIII, p. 96, Belgaum; Syd., p. 379, on leaves of *Terminalia Catappa*, Auda Tode, Wynaad. This species occurs throughout the tropics.

Meliola asterinoides, Wint. var. **maior**, Gaill.

Type from Africa; Syd, p. 379, on leaves of *Webera corymbosa*, Bilikere, Mysore.

Meliola Butleri, Syd. l. cit.

On *Citrus medica* var. *acida*, Chittagong; on *Citrus decumana*, Kya-in, Amherst District, Burma.

Meliola cladotricha, Lév.

Syd., p. 380, on leaves of *Eugenia jambolana*, Cottamunda, Wynaad ; on leaves, Kya, Amherst Dist.

Known originally from Borneo, New Guinea and Australia.

Meliola clavulata, Wint.

Syd., l. cit., on leaves of *Ipomoea Tellicherry*, Malabar ; Pulliyanur, Travancore ; on *Argyreia hirsuta*, Balehonnur, Mysore.—Known originally from Africa.

Meliola Diospyri, Syd., p. 381.

On *Diospyros montana*, Sidrabunna, Koppa, Mysore.

Meliola geniculata, Syd. l. cit.

On leaves of *Odina wodier*, Pulliyanur, Travancore.

Meliola indica, Syd., p. 382.

On *Barringtonia acutangula*, Dacca.

Meliola Mangiferae, Earle.

Syd. l. cit., on *Mangifera indica*, Pulliyanur, Travancore.—Originally known from Portorico.

Meliola palmicola, Wint.

Syd. l. cit., on *Phoenix*, Mudigere, Mysore ; Chittagong ; Burdwan, Bengal ; Hunsur, Mysore ; Ramachendrapur, Godavari.—Syn.: *M. contigua* K. et R.; known from Florida and Tonkin.

2.—MICROTHYRIALES.

Asterina pemphidioides, Cke. Grevill. V, p. 16.

Syn.: *Ast. crustosa* B. et Cke.

Ast. Fumago (Niessl.) v. H.

On leaves (locality unknown): Grev. l. cit ; on *Eugenia jambolana*, Godavari (Syd., p. 390), cfr. on this species Theissen, Fragmenta Brasil. No. 109, 201 (Annal. mycol. 1911).

[**Asterina concentrica**, Cke. Grevill. XIV. p. 13.]

On culms of *Saccharum*, N. W. India. Belongs to the Dothideaceæ (cfr. Theissen, Fragm. brasil. No. 90), without fruit and cannot be further considered.

[**Asterina scutellifera**, Berk. Syll. I, p. 50.]

On leaves of *Antidesma*, Chittagong.—Undeveloped, cfr. Theissen l. cit. No. 102.

Asterina congesta, Cke. Grevill. VIII, p. 96.

On leaves of *Santalum album*, Belgaum.

Asterina carbonacea, Cke. Grevill. l. cit.

On coriaceous leaves, Belgaum.

[**Asterina cincta**, Berk. Syll. I, p. 43.]

On leaves of *Camellia*, Khasia.—This undeveloped and wrongly described species is to be replaced by the following:

Asterina Camelliae, Syd. et Butl. Syd. p. 389.

On *Camellia Thea*, Dunmur Dullung, Sibsagar District, Assam. Cfr.

Theissen, Fragm. bras. n. 169.

Asterina Capparidis, S. et B.-Syd. p. 390.

On *Capparis*, Madras.

Asterina incisa, Syd. l. cit.

On *Webera corymbosa*, Balehonnur, Mysore.

Asterina indica, Syd., l. cit.

On *Symplocos*, Darjeeling.

Asterina Lawsoniae, P. H. et Nym Syd. l. cit.

On *Lawsonia alba*, Pusa.

Originally described from Java.

Asterina magnifica, Syd. et Butl. l. cit.

On *Terminalia*, Moulmein, Burma.

Asterina malabarensis, Syd. l. cit.

On *Pothos scandens*, Kanouth, Malabar.

Asterina spissa, Syd., p. 392.

On *Jasminum*, Chittagong.

Asterina Stuhlmanni, P. Henn. Syd. l. cit.

On *Ananassa sativa*.—Original from Africa.

Microthyrium microscopicum, Desm.

Grevill. VIII, p. 96, Belgaum.

Calothyrium aspersum, (Berk.) Theiss.

Syn.: *Asterina aspersa*, Berk. Syll. I, p. 45.

Microthyrium aspersum, (Berk.) v. H.

On leaves of *Laurus*, Khasia. Cfr. Theissen, Zur Revision d. G. Microthyrium No. 17 (Oest. Bot. Zeitschr. 1912).

Seynesia grandis, (Niessl.) Wint. Syll. IX, p. 1064.

On dry culms of *Calamus*, Calcutta.

Vizella conferta, (Cke.) Sacc.

Syn.: *Micropeltis conferta*, Cooke Grevill. VI, p. 118.

On leaves of "Bhauri" (*Symplocos spicata*), Dinagepore.

Myiocopron orbiculare, (Cke.) Sacc.

Syn.: *Micropeltis orbicularis*, Cooke Grevill. VI, p. 118.

On *Symplocos spicata*, Dinagepore.

3.—HYSTERIINEÆ.

Lembosia caespitosa, (Cooke) Sacc.

Syn.: *Ailographium caespitosum*, Cke. Grev. VIII, p. 95.

On coriaceous leaves, Belgaum.

Aulographum vagum, Desm. Syll. II, p. 727.

On coriaceous leaves, Himalaya.

Lophocermium Pinastri, (Schrad.) Chev.

Syn., p. 378, on *Pinus excelsa*, Achibal, Kashmir.

AcrospERMUM parasiticum, Syd. l. c.

On leaves of *Heptapleurum venulosum*, Kumaon, Himalaya.

4.—PLECTASCINEÆ.

Thielavia basicola, Zopf. Syd. l. cit.

On roots of *Viola odorata*, Lahore.

Originally described on roots of *Senecio elegans*, in the Bot. Gardens Berlin.

5.—DISCOMYCETES.

Helvelia crispa, Fr. Grevill. IX, p. 13; Syll. VIII, p. 18.

On the ground, Punjab; Syd., p. 374, Achibal, Kashmir.

Morchella bohémica, Kromb. Syll. VIII, p. 10.

Grevill. V., p. 16, on the ground, Kashmir. "Eaten by the natives; dried and sent down into the plains." (It seems doubtful, whether the identification was correct; it was, perhaps, the following.

Morchella esculenta, Pers. Syll. viii, p. 8.

Grevill. V., p. 16, on the ground, Kashmir; Syd., p. 374.

Amritsar; Ranikhet, Kumaon, Himalaya.

Morchella deliciosa, Fr. Syll. VIII, 10.

Syd., p. 374, on the ground, Amritsar.

Morchella conica, Pers. Syll, VIII, p. 9.

On the ground, Dehra Dun (Theissen, F. Bombay. Ann. mycol. 1911, p. 158) var. *acuminata*, Kickx.

Siwalik Range (P. Henn. F. Ind. Orient. II, Hedwigia 1901, p. 338).

Rhizina reticulata, B. et Br. Syll. VIII, p. 58.

On the ground, Neilgherries.

Rh. zonata, Berk. Syll. VII, p. 59.

Amongst *Pinus* leaves, Darjeeling.

Peziza epispertia, B. et Br. Syll. VIII, p. 89.

Grevill VIII, p. 96, Belgaum.—Type from Ceylon.

Otidea darjeelensis, Cooke.—Syll. X, p. 4.

Darjeeling, on the ground.

Lachnea geneospora, Berk.—Syll. VIII, p. 178.

On wood; locality unknown.

Helotium pusense, Syd., p. 374.

On twigs of *Ricinus communis*, Pusa.

Ombrophila indica, Syd., p. 375.

On rotten wood, Dehra Dun.

Pseudopeziza medicaginis, (Lib.) Sacc.

Syd., p. 375, on leaves of *Medicago sativa*, Poona; on *Medicago lupulina*, Harwan, Kashmir.

Known from Europe, South America, Siberia.

Pseudopeziza repanda, (Fr.) Karst. Syll. VIII, p. 727.

Syd. l. cit. on leaves of *Galium*, Kasauli.

Known from Europe.

Pseudopeziza trifolii, (Biv. Bernh.) Fuck.—Syll. VIII, p. 723.

Syd. l. cit. on leaves of *Trifolium pratense*, Verinag, Kashmir.

Chlorosplenium ærugineum, (Berk.) Sacc.—Syll. VIII, p. 318.

Syn. : *Peziza æruginea*, Berk.

On decayed wood, Khasia.

Lachnella nilgherrensis, Cke.—Syll. X, p. 20.

Grevill. XIX, p. 73, in caulibus herbaceis ; locality unknown.

Dasyascypha Emerici, (Berk. et Phil.) Sacc. Syll. X, p. 22.

Grevill. XIX, p. 74, on branches, Nilgherries.

Bulgaria chalybaea, (Berk.) Cke. et Mass. Syll. X, p. 41.

Grevill. XIX, p. 41, on wood, Darjeeling.

Lagerheimia Carteri, (Berk.) Sacc. Syll. X, p. 55.

Syn. : *Patellaria Carteri*, (Berk.) Phil.

Grevill. XIX, p. 75, on dead wood, Bombay.

Aleurina orientalis, (Pat.) Sacc. et Syd.

Syn. : *Phæopezia orientalis*, Pat. Syll. X, p. 24.

Syd., p. 374, on cow dung, Pusa.—Type from Tonkin.

Saccobolus Kerverni (Crouan) Boud.—Syll. VIII, p. 524.

Syd., l. cit., on horse dung, Pusa.—Common European species.

Tryblidiella rufula, (Spreng.) Sacc.

Syd., p. 375, on branches of *Citrus*, Sagaryng, Burma ; Pullianur, Travancore ; Dehra Dun.—Known also from N. America and Brazil.

Pseudophacidium indicum, Syd., p. 375.

On branches, Dehra Dun.

Phacidium symplocinum, Syd., p. 376.

On living leaves of *Symplocos*, Darjeeling.

Cryptomyces Pongamiae, (B. et Br.) Sacc.

Syd. l. cit. on leaves of *Pongamia glabra*, Islampur, Bombay Presidency.

Schizothyrium annuliforme, Syd., p. 376.

On living leaves of *Acer oblongus*, Mussoorie.

Coccomyces vilis, Syd. et Butl.—Syd., p. 377.

On leaves of *Mangifera indica*, Malda.

Rhytisma conoideum, Cooke. Syll. VIII, p. 761.

Grevill. V, p. 16, on leaves (sterile).

Rhytisma durissimum, Cooke l. cit.

On coriaceous leaves (sterile).

Rhytisma ustulatum, Cooke Grevill. V, p. 17.

On dead leaves (*Ficus*?).

Rhytisma fuscum, Fr.—Syll. VIII, p. 759.

On *Sapindacea* (sterile).

The last three species are very doubtful.

Rhytisma acerinum, (Pers.) Fr.

Syd., p. 377, on leaves of *Acer cæsius*, Harwan, Kashmir; Darjeeling.

Rhytisma himalense, Syd. et Butl.—Syd., p. 377.

On leaves of *Ilex* (*dipyrena* ?), Ranikhet, Kumaon, Himalaya.

Rhytisma piceum, Berk.—Syll. VIII, p. 762.

Syn.: *Rhytisma pieridis*, Pat.—Syll. XIV, p. 817, from Tonking.

Tambur Vall, Nepal. Syd., p. 378, on *Pieris*, Ranikhet, Kumaon, Himalaya; on *Pieris ovalifolia*, Nepal.

6.—DOTHIDEALES.

Phyllachora demersa, (Corda) Sacc. Syll. II, p. 595.

Syn.: *Sphæria demersa*, Corda.

Dothidea demersa, Corda.

On living leaves (*Ixora* ?); Grevill. V, p. 16.

Phyllachora annulata, (Cke.) Sacc. Syll. II, p. 610.

Syn.: *Dothidea annulata*, Cooke, Grevill. VIII, p. 95.

On leaves of unknown tree, Belgaum.

“A curious species, with the perithecia forming little rings, but entirely sterile.”

Phyllachora Ficuum, Niessl. Syll. II, p. 598.

On leaves of *Ficus infectoria*, Calcutta; Syd., p. 395, on *Ficus mysorensis*, Yelwal, Mysore; on *Ficus mysorensis* var. *pubescens*, Wynaad.

Phyllachora infectoriae, Cke. Bilikere, Mysore; on *Ficus religiosa*, Jessore, Bengal; Syd., p. 396.

Phyllachora aspidea, (Berk.) Sacc. Syll. II, p. 598.

Syn.: *Dothidea aspidea*, Berk. (from Ceylon).

Syd., p. 396, on (*Ficus scandens* ?), Ranikhet, Kumaon, Himalaya.

Phyllachora topographica, Sacc.

Syn.: *Phyllachora marmorata*, Rac. (from Java).

Syd. l. cit., on *Ficus*, Wynaad; on *Ficus hispida*, Chittagong.

Phyllachora abyssinica, P. Henn.

Syd. l. cit. on *Ficus* sp., Assam.—(Type from Abyssinia.)

Phyllachora Musae (Kl.) Sacc. Syll. II, p. 613, 625; IX, p. 1023.

Grevill. XIII, p. 64, on *Musa*.

Phyllachora repens, (Corda) Sacc. Syll. II, p. 598.

Syn.: *Dothidea repens*, Corda.

Grevill. V, p. 16, on *Ficus gossypina*; VIII, p. 95, on *Ficus religiosa*, Belgaum; Syd., p. 396, on *Ficus religiosa*, Madras.

Phyllachora rhytismoides, (Corda) Sacc. Syll. II, p. 595.

Syn.: *Dothidea rhytismoides*, Corda.

On *Acacia* sp., Tenasserim.

Phyllachora Chionachnes, Syd.—Syll. XVII, p. 839.

On living leaves of *Chionachne barbata*, Panjab.

Phyllachora viventis, (Cke.) Sacc. Syll. II, p. 601.

Syn.: *Dothidea viventis*, Cooke. Grevill. V., p. 16.

On living leaves of *Leguminosæ*.

Phyllachora Dalbergiae, Niessl—Syll. II, p. 595.

Syd., p. 397, on *Dalbergia Sissoo*, Pusa; on *Dalbergia* sp., Bilin, Burma.

—Type from Calcutta.

All the following *Phyllachora*-species are mentioned by Sydow, p. 397, sqq.

Phyllachora Pongamiae, P. Henn.

On *Pongamia glabra*, Madras.

Phyllachora Desmodij, P. Henn.

On *Desmodium* sp., Harwan, Kashmir.

Phyllachora ? tenuis, (Berk.) Sacc.

On *Bauhinia vahlii*, Kirkee, Bombay Presidency.—Type from Nicaragua.

Phyllachora ? fimbriatylicola, Speg.

On *Fimbriatylis* sp., Dauracherra, Assam; on *F. dichotoma*.—Kanaighat Assam.

Phyllachora Coicis, P. Henn.

On *Coix lacryma Jobi*, Wynaad, Malabar.

Phyllachora Cynodontis, (Sacc.) Niessl.

On *Cynodon Dactylon*, Bankipore.—Very common.

Phyllachora Cyperi, Rehm var. **Donacis**, Berl. et F. Sacc.

On *Arundo*, Wahjain, Assam; on *Imperata arundinacea*, Khasi Hills, Assam; on *Andropogon muricatus*, Pusa; on *Saccharum spontaneum*, Pusa.

Phyllachora graminis, (Pers.) Fuck.

On *Isachne*, Kaneighat, Sylhet, Assam; on *Panicum*, Panora, Wynaad; on *Andropogon assimilis*, Kumaon, Himalaya and Dehra Dun; on *Andropogon micranthus*, Maymyo, Burma; on *Anthistiria*, Wynaad; on *Pogonatherum saccharoideum*, Kumaon, Himalaya; on *Pallinia grata*, Moulmein, Burma; on *Oryzopsis*, Wynaad; *Panicum* sp., Wahjain; *Ischaemum laxum*, Bilin, Burma; *Panicum colonum*, Champaran, Bengal; *Centotheca lappacea*, Moulmein, Burma; *Andropogon* sp., Roppa, Mysore.

Phyllachora Bischofia, Syd.

On *Bischofia javanica*, Panora, Wynaad.

Phyllachora dolichospora, Syd.

On *Tinospora cordifolia*, Solebile, Mysore.

Phyllachora erebia, Syd.

On *Caragana* sp., Harwan, Kashmir.

Phyllachora permixta, Syd.

On *Schima wallichii*, Maymyo, Burma.

Phyllachora transiens, Syd.

- On *Eurya acuminata*, Kumaon, Himalaya.
Phyllachora spissa, Syd.
 On *Dalbergia sissoo*, Wynaad.
Phyllachora malabarensis, Syd. et Butl.
 On *Bambusa*, Wynaad, Malabar.
Phyllachora Shiraiana, Syd.
 On *Arundinaria*, Wahjain, Assam.
Phyllachora Rottboelliae, Syd. et Butl.
 On *Rottboellia exaltata*, The Droog, Nilgiri Hills.
Ophiodothis vorax, (B. et C.) Sacc. Syll. II, p. 652.
 Syn.: *Dothidea vorax*, B. et C.—On *Carex*, Khasia.
Ophiodothis sclerotica, (Pat.) P. Henn. Syll. XVI, p. 633.
 Syn.: *Epichloe sclerotica*, Pat. Syll. IX, p. 1002 (from Tonkin).
 On the inflorescence of *Andropogon nardus*, Erramacola, Wynaad; *A. Schænanthus*, Vayitri, Wynaad; *A. sp. sp.*, Chatrapur, Ganjam; Belgaum.
Metachora Bambusæ, Syd. et Butl.
 On *Bambusa*, Kanouth, Malabar.
Bagnisiella Tamaricis, (Cke.) Sacc. Syll. II, p. 590.
 Syn.: *Dothidea Tamaricis*, Cooke. Grevill. XI, p. 108.
 Syd., p. 401, on *Tamarix gallica*, Pusa.—Type from N. America.
Dothidella bambusicola, Syd. et Butl.—Syd., p. 401.
 On *Bambusa*, Moulmein, Burma.
Dothidella dispar., Syd. l. cit.
 On *Andropogon contortus*, Tellicherry, Malabar.
Scirrhia seriata, Syd. et Butl.—Syd., p. 402.
 On *Bambusa*, Moulmein, Burma.
 ? **Dothidea Terminaliæ**, Syd., p. 401.
 On *Terminalia catappa*, Wynaad.
Apiospora camptospora, Penz. et Sacc.—Syll. XIV, p. 534.
 On *Saccharum officinarum*, Bilin, Burma (Syd., p. 402)—Type from Java.
Apiospora Montagnei, Sacc. Syll. I, p. 539.
 Syn.: *Sphaeria apiospora*, Dur. et Mont.
Hypopteris apiospora, (Mont.) Berk.
 On *Bambusa*, Nangki; Syd., p. 402, on *Bambusa*, Wynaad.—Known from Europe, Algeria, N. America.

7.—HYPOCREALES.

- Polystigma ochraceum**, (Wahlb.) Sacc. Syll. II, p. 458.
 Syn.: *Polystigma fulvum*, DC.
Sphaeria ochracea, Wahlb.
 Cited in Grevill. VI, p. 117, on leaves of *Prunus Padus*, Jubal State, N. W. Himalaya (18,000 feet).—Species known from Europe.
Nectria collabens, Berk. et Cke. Syll. IX, p. 958.

Grevill. XII, p. 81, on bark, Bombay.

Nectria alutacea, B. et Cke. Grevill. XII, p. 81 Syll. 1. cit.

On bark, Neilgherries.—The species belongs to the group of *N. ochroleuca* (Schw.) Berk.—Cfr. on this and other species of *Nectria*; Weese and v. Höhnel "Zur Synonymie der Nectriaceen" in Annal. myc. fasc. 4, 1910 and 1911.—*N. ochroleuca* is a widely spread species.

Nectria lætifulva, B. et Cke. Grevill. XII, p. 82; Syll. IX, p. 961.

On bark, Neilgherries.

Nectria xanthostigma, B. et Cke. ll. cit.

On herbaceous stems, Neilgherries.

Nectria bolbophylli, P. Henn. Syll. XVII, p. 790.

Syd., p. 392, on stems of *Cajanus indicum*, Dehra Dun; on bark of *Piper niger*, Vayitri, Wynaad; on *Piper betle*, Shiggaon, Bombay Presidency; on *Cocos nucifera*, Pulliyanur, Travancore; on culms of *Oryza sativa*. Chittagong.

This widely spread species shows numerous forms, such as *N. Citri*, P. Henn.; *calonectricola*, P. H.; *citricola*, P. H.; *Victoriae*, P. H.; *luteococcinea*, v. Höhn.; *bogoriensis*, P. H., *asperata*, Rehm; *Melanommatis*, Syd. a. o.

Nectria cinnabarina, (Tode) Fr. Syll. II, p. 479.

Syn.: *N. ochracea* (Grev.) Fr. Syll. II, p. 487.

Syd., p. 393, on branches of *Populus ciliata*, Verinag, Kashmir; of *Prunus armeniaca*, Achibal, Kashmir.—The species occurs also in Europe, Ceylon, Siberia, N. America and Brazil.

Nectria subcoccinea, Sacc. et Ell. Syll. II, p. 482.

Syn.: *N. Colletiae*, Rehm. Syll. XVI, p. 578.

N. coccidophthora, Zim. Syll. XVII, p. 784.

Syd., p. 393, on *Piper niger*, Wynaad.—The species occurs in N. America, Brazil and Java.

Nectria diversispora, Petch. Syd. 1. cit.

On *Hevea brasiliensis*, Mergui, Burma.—Type from Ceylon.

Nectria heterosperma, K. et Cke. Syll. II, p. 485.

Syd., 1. cit., on dead branches, Dehra Dun.—Type from South Africa.

Nectria tjibodensis, Penz. et. Sacc. Syll. XIV, p. 636.

Syn.: *N. bogoriensis*, P. H.; *ochracea*, P. H.; *Iriarteæ*, P. H.; *flocculenta* P. H. et Nym.

Syd. 1. cit., on stems of *Guazuma tomentosa*, Pusa.—Known also from Java and Brazil.

Melanospora parasitica, Tul. Syll. II., p. 464.

Syd., p. 392, on *Cephalosporium Lecanii*, on leaves of *Coffea arabica*, Mysore.—European species.

Melanospora Zamia, Corda, Syll. II, p. 463.

Syd. 1. cit., on culms of *Oryza sativa*, Noakhali.—Known from Europe and Australia.

Hypomyces chrysospermus, Tul. Syll. II, p. 467.

Syd., p. 394, on *Boletus* (?), Khasi Hills, Assam—European species.

Sphærostilbe gracilipes, Tul. Syll. II, p. 513.

Syd. l. cit., on dead branches, Pullianur, Travancore.—Known from Cuba and Ceylon.

Hypocrea flavo-virens, Berk. Syll. IX, p. 976.

Grevill. XII, p. 100, on bark, Neilgherries.

Hypocrea grossa, Berk. Syll. II, p. 528.

On wood—Locality unknown.

Hypocrea subrufa, Berk. Syll. IX, p. 972.

Grevill XII, p. 79, on branches, Neilgherries.

Hypocrea rugulosa, Berk. et Cooke Syll. IX, p. 973.

Grevill XII, p. 79, on rotten wood, Neilgherries; var. *maior* ibidem, on bark of trees.

Hypocrea undulata, B. et Cke. Grevill. XII, p. 79.

Syn.: *Hypocreopsis undulata* (B. et Cke.) Sacc. Syll. IX, p. 981.

On rotten wood, Neilgherries.

Hypocrea Nilgherrensis, B. et Cke. Syll. IX, p. 979.

Grevill. XII, p. 79, on bark, Neilgherries.

Hypocrea Carteri, B. et Cke. Grevill. XII, p. 79.

Syn.: *Hypocreopsis Carteri* (B. et Cke.) Sacc. Syll. IX, p. 981.

On bark, Bombay.

Pleogibberella calamia, (Cooke) Berl. et V. Syll. IX, p. 992.

Syn.: *Gibberella calamia*, Cooke.

On *Calamus fasciculatus*; locality unknown.

Balansia andropogonis, Syd., p. 395.

On the inflorescence of *Andropogon aciculatus*, Forbesganj, Purnea, Bengal.

Cordyceps Ridleyi, Mass. Syll. XVI, p. 611.

On ant, Selangor.

Cordyceps falcata, Berk. Syll. II, p. 575.

On larvas; locality unknown.

Cordyceps racemosa, Berk. Syll. II, p. 576.

On larvas; locality unknown.

Epichloe cinerea, B. et Br. Syll. II, p. 579.

Syd., p. 394, on the inflorescence of *Eragrostis tenuifolia*, Hunsur and Bilikere, Mysore—Type from Ceylon.

Epichloe Bambusae Pat., Syll. XIV, p. 655.

Syd., p. 395, on culms of *Bambusa*, South India.—Type from Java.

Hypocrella semiamplexa, (Berk.) Sacc. Syll. II, p. 581.

On *Bambusa*; locality unknown.

Hypocrella Panici, Mass. Syll. XVI, p. 603.

On culms of *Panicum*, Selangor.

Endothia hypocreoides, (B. et Cke.) v. Höhn.

Syn.: *Nectria hypocreoides*, B. et Cooke, Grevill. XII, p. 81.

Syll. IX, p. 958, on bark, Bombay.—Cfr. Weese et v. Höhn. in Ann. mycol. 1910, p. 466.

Neocosmospora vasinfecta, Smith. Syll. XVI, p. 562.

Syd., p. 394, on roots of *Cajanus indicum*, *Crotalaria juncea*, *Indigofera arrecta*, *Cicer arietinum*, Pusa.—Type from North America.

On the morphology of this species and its saprophytic nature in East India Cfr. E. J. Butler. "The wilt disease of pigeon pea and the parasitism of *Neoc. vasinfecta* (Mem. Dept. of Agric. in India, Botan. Series II, No. 9, Jan. 1910).—This species was also observed in India, on *Vigna Catjang*, *Cyamopsis psoraloides*, some cultivated *Gossypium*-species and *Indigofera sumatrana*." (Syd. l. cit.)

8.—MYRIANGALES.

Myriangium Durieui, Mtg. et Berk.

Syd., p. 395, on bark, Pusa.

9.—SPHÆRIALES.

Apiospora Montagnei (Pass.) Sacc. Syll. I, p. 539.

On *Bambusa*, Nangki.

Læstadia Theæ, Rac.

?Syn.: *L. Camellie* (Cke.), Berl. et V.

Syd., p. 406, on leaves of *Camellia Thea*, Dooars, Bengal.—Type from Java.

Læstadia perusia (B. et Br.), Sacc. Syll. I, p. 430.

Syd. l. cit., on leaves of *Dioscorea*, Chittagong.—Type from Ceylon.

Sphærella Bhauria, Cooke-Syll. I, p. 489.

Grevill. VI, p. 118, on leaves of "Bhauri" (*Symplocos spicata*), Dinagepore.

Physalospora Bambusæ (Rabh.), Sacc. Syll. I, p. 496.

Syn.: *Sphæria Bambusæ*, Rabh.

On leaves of *Bambusa spinosa*, Calcutta Bot. Garden.

Physalospora Calami, Syd., p. 407.

On *Calamus tenuis*, Chittagong.

Physalospora transversalis, Syd., p. 407.

On leaves of *Cocos nucifera*, Bilin, Burma.

Physalospora ventricosa (Dur. et Mtg.), Cke. Syll. XI, p. 292.

Syd., p. 408, on dead twigs of *Ricinus communis*, Pusa.—Type from North Africa.

Physalospora xanthocephala, Syd., p. 408.

On branches of *Cajanus indicum*, Pusa.

Anthostomella Pandani (Rabh.), Sacc. Syll. I, p. 292.

Syn.: *Sphæria Pandani*, Rabh.

On leaves of *Pandanus furcatus*, Calcutta.

Anthostomella Bambusæ (Lév.), Sacc. Syll. I, p. 289.

Syn. *Sphæria Bambusæ* Lév.

Hypopteris Bambusæ Berk.

On culms of *Bambusa arundinacea*, Nangki.

Metasphæria Boehmeriæ (Rabh.), Sacc. Syll. II, p. 156.

Syn.: *Sphaerella Boehmeria*, Rabh.

On dry stems of *Boehmeria nivea*, Calcutta.

Metasphæria celastrina, Syd. et Butl., p. 408.

On dead branches of *Celastrus*, Pusa.

Paranthostomella Capparidis, Syd. et Butl., p. 408.

On leaves of *Capparis spinosa*, var. *cucophylla*, Pusa.

Leptosphæria Agaves, Syd. et Butl., p. 409.

On leaves of *Agave rigida*, var. *Sisalana*, Douracherra, Assam.

Leptosphæria Eriobotryæ, Syd. et Butl., p. 409.

On leaves of *Eriobotrya japonica*, Saharanpur.

Leptosphæria indica, Syd. et Butl., p. 409.

On leaves and twigs of *Asparagus*, Wynaad.

Leptosphæria Sacchari, v. Breda. Syll. XI, p. 324.

Syd. l. cit., on leaves of *Saccharum officinarum*, Dehra Dun; Bilin, Burma.—Type from Java.

Ophiobolus Cajani, Syd., p. 409.

On dead twigs of *Cajanus indicum*, Pusa.

Ophiobolus Manihotis, Syd., p. 410.

On *Manihot utilisima*, Pullianur, Travancore.

Ophiobolus Porphyrogonus, (Tode), Sacc. Syll. II, p. 338.

Syd., p. 410, on stems of *Vigna Catjang*, Pullianur, Travancore.—Known from Europe, North and South America.

Pleospora spinarum, Syd., p. 410.

On spines of *Astragalus*, Achibal, Kashmir.

Massarina usambarensis, (P. Henn.) v. Höhn. Fragm. Z. Myk. XII, p. 46.

Syn.: *Holstiella usambarensis*, P. Henn. Syll. XIV, p. 594.

Syd., p. 410, on bark of *Feronia elephantum*, Chittagong.—Type from Africa.

Massaria marginata, Fuck. Syll. II, p. 9.

Syd. l. cit., on twigs of *Rosa*, Harwan, Kashmir.—European species.

Pleomassaria ilicina, Syd. et Butl., p. 411.

On bark of *Ilex (diphyrena ?)*, Ranikhet, Kumaon, Himalaya.

Astrocystis mirabilis, B. et Br. Syll. I, p. 293.

Syd. l. cit., on culms of *Bambusa*, Balsar, Bombay Presidency.—Type from Ceylon.

Trabutia ambigua Syd., p. 411.

On leaves of *Eugenia Jambolana*, Koppa, Mysore.

Trabutia cayennensis, (D C.), Sacc. Syll. I, p. 449.

Syn. : *Xyloma cayennense*, D C.

Sphæria cayennensis (D C.), Fr.

On *Myrtacea* ; locality unknown.—Type from South America.

Sphæria constellatio, Berk. Syll. II, p. 398.

On leaves, Khasia.

Trichosphæria macularis, Syd. et Butl., p. 402.

On leaves, Pulliyanur, Travancore.

Melanomma citricola, Syd. et Butl., p. 405.

On bark of *Citrus medica*, Chittagong.

Melanomma glumarum, Miyake.

Syd., p. 406, on culms and glumes of *Oryza sativa*, Chittagong.

Rehmiomyces profusus, Syd. et Butl.

On dead branches of *Cajanus indicum*, Dehra Dun.

Boerlagella effusa, Syd. et Butl., p. 403.

On wood and branches of *Populus ciliata*, Mussoorie.

Acanthostigma heterochæta, Syd. et Butl., p. 403.

On living leaves of *Phaseolus Mungi*, var. *radiatus*, Pusa ; on *Dumassia villosa*, Nagpur ; on *Dumassia* sp., Samalkota.

Rosellinia picta (Berk.), Cooke Grevill, XV, p. 81 ; Syll. IX, p. 496.

Syn. : *Hypoxylon pictum*, Berk.

On decorticated wood, Neilgherries.

Rosellinia andurnensis, Ces. et de N. Syll. I, p. 253.

Syd., p. 404, on dead twigs, Dehra Dun.—European species.

Rosellinia bunodes, (B. et Br.), Sacc. Syll. I, p. 254.

Syd., p. 404, on stumps of *Litsæa angustifolia*, Hassan, Mysore.—Type from Ceylon, known also from Java.

Syd. l. c. : “ *Rosellinia bunodes* causes on *Piper nigrum* in Mysore and other trees (*Litsæa Wightiana*, *Schleichera trijuga*, *Holigarna longifolia*, *Grevillea robusta*) a disease known as ‘stump rot’ which is fatal to the trees attacked. Massee was the first to draw the attention to this disease of the Black Pepper (Kew Bull. 1895, p. 178), but did not identify it. It has been figured by Penzig and Sacc. in Ic. F. Jav. t. IV, f. 4, and described by Petch in ‘Revisions of Ceylon Fungi’ II, p. 434.”

Rosellinia Mangiferæ, Syd., p. 405.

On bark of *Mangifera indica*, Chittagong.

Rosellinia picacea, Mass. Syll. XVI, p. 438.

On dead bark, Bot. Gardens, Singapore.

Rosellinia echinata, Mass. Syll. XVII, p. 597.

On roots of *Ficus dubia*, Bot. Gardens, Singapore.

Amphisphæria Khandalensis, Rehm.

On *Bambusa*, Khandala. Cfr. Theissen, “F. Bombayenses” in Ann. Mycol. 1911, p. 158.

Chætosphærla indica, Niessl. Syll. II, p. 96.

On leaves of *Alangium decapetalum*, Calcutta.

Chætomium indicum, Corda. Syll. I, p. 220.

Grevill. IV, p. 117., on paper, Burma.

Chætomium amphitrichum, Corda, Syll. I, p. 228.

Syd., p. 402, on dead palm-leaves, Tenasserim; on trunks of *Gossypium indicum*, Nagpur.

Cucurbitaria Agaves, Syd. et Butl.

Syd., p. 406, on leaves of Agave, Dehra Dun.

Corynelia clavata (L.), Sacc. Syll. IX, p. 1073.

On *Podocarpus*, Khasia.—Known from Africa, New Zealand, Venezuela. Syll. XVI, p. 650 gives as synonyms *Albofia oreophila*, Speg. (from Argentina) and *Trullula tropica* (Awd. et Rabh.) Sacc. from Chile.

Corynelia fructicola (Pat.) v. Höhn.

Syn. : *Capnodium fruticolum*, Pat. Syll. IX, p. 441.

Syd., p. 406, on fruits of *Myrsine africana*, Mussoorie.—Type from China.

Valsa nepalensis (Berk.), Sacc. Syll. I, p. 125.

Syn. : *Sphaeria nepalensis*, Berk.

On dead branches of *Betula*, East Nepal.

Valsa Corchori, Syd. et Butl., p. 412.

On branches of *Corchorus sp.*, Poona.

Cryptovalsa Rabenhorstii (Nke.), Sacc. Syll. I, p. 190.

Syn. : *Valsa Rabenhorstii*, Nke.

Sphaeria spiculosa, var. *Robiniae*, Rabh.

Syd., p. 412, on cultivated *Morus*, Pusa.—European species.

Cryptovalsa indica, Syd., p. 412.

On corticated branches, Dehra Dun.

Cryptovalsa planiuscula, Syd. et Butl. l. cit.

On dead branches, Pusa.

Allescherina Boehmeriæ, Syd. et Butl., p. 413.

On dead branches of *Behmeria nivea*, Pusa.

Allescherina Cajani, Syd. et Butl. l. cit.

On dead branches of *Cajanum indicum*, Pusa.

Eutypella Zizyphi, Syd. et B., p. 413.

On dead branches of *Zizyphus jujuba*, Pusa.

Eutypella Vitis (Schw.), E. et E.—Syd. l. cit.

On wood of *Vitis vinifera*, Poona.—Type from North America.

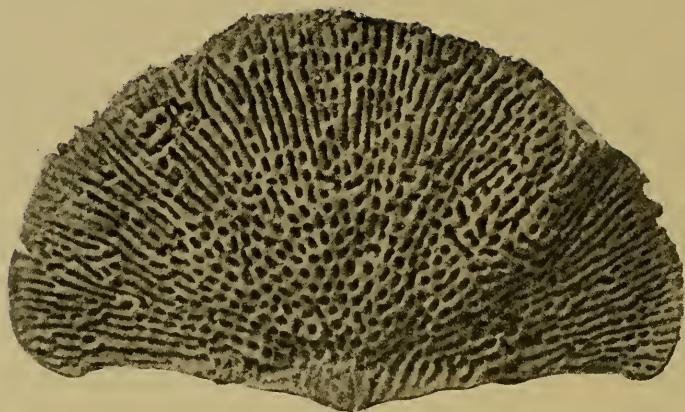
Peroneutypella ambiens, Syd., p. 414.

On decayed twigs, Dehra Dun.

Peroneutypella indica, Syd. et B., p. 414.

On dead branches of *Dalbergia Sissoo*, Pusa.

Peroneutypella pusilla, Syd. l. cit.



A



B



C

A.—*Lenzites ochroleuca*.

B.—Under Surface of a *Hydnum*.

C.—*Clavaria cinerea*.

On dead corticated branches of *Citrus*, Sagaing, Burma.

Anthostoma Carteri (B. et Cke.), Berl. et V. Syll. IX, p. 520.

Syn.: *Fuckelia Carteri*, B. et Cooke Grevill. XII, p. 51.

On bark, Bombay.

Diatrype chlorosarca, B. et Br. Syll. I, p. 195.

Syd., p. 415, on dead culms of *Bambusa*, Tellicherry, Malabar; on branches, Pulliyanur, Travancore; Dehra Dun; Palghat.

Malabar.—Type from Ceylon.

Botryosphæria Agaves (P. Henn.), Butl.

Syn.: *Physalospora Agaves*, P. H. Syll. XVII, p. 585.

Syd., p. 415, on leaves of *Agave*, Pusa.—Type from East Africa.

Botryosphæria egenuia, Syd. et Butl.—Syd. p. 415.

On leaves of *Cymbidium*, Gauhati, Assam.

Hypoxyton ochraceo-fulvum, B. et Cke. Syll. IX, p. 554.

Grevill. XI, p. 133, on bark, Nirwab Jungle.

Hypoxyton deciduum, B. et Br. Syll. I, p. 369.

On palm-leaves, Ceylon, Borneo, India.

Hypoxyton perforatum (Schw.), Fr. Syll. I, p. 375.

On wood, Europe, N. America, Ceylon, India.

Hypoxyton udum (Pers.), Fr. Syll. I, p. 386.

Syn.: *Sphaeria confluens*, Tode.

Sphaeria albicans, Pers.

Sphaeria ordinata, Fr.

Sphaeria lineata, D C.

On wood, Europe, Borneo, India.

Hypoxyton vividum, B. et Br. Syll. I, p. 359.

On bark, Bombay (Theissen, *F. Bombayenses*, Ann. mycol. 1911, p. 159; Syd., p. 417). Type from Ceylon.—Syd., p. 417, on wood, Chittagong Calcutta; Pusa; Surat.

Hypoxyton coccineum, Bull. Syll. I, p. 353.

On wood, Europe, N. America, Australia, Cuba, India.

Hypoxyton multiforme, Fr. Syll. I, p. 363.

On wood, Europe, N. America, Kamtschatka, India.

Hypoxyton Hookeri, Berk. Syll. IX, p. 548.

Grevill. XI, p. 129. On wood, India; locality unknown.

Hypoxyton atropurpureum, Fr. Syll. I, p. 375.

On wood, Europe, N. America, South America, Java, India; Syd., p. 475. On wood of *Tamarindus indica*, Surat.

Hypoxyton fusco-purpureum, (Schw.) Fr. Syll. I, p. 378.

Syd., p. 416, on dead culms of *Bambusa*, Bulsar, Bombay Presidency.—Occurs also in N. America, Cuba and Brazil.

Hypoxyton stygium, (Lév.) Sacc. Syll. I, p. 379

Syd., p. 416, on bark of *Ficus glomerata*, Pusa. I collected specimens

with exactly the same characters in Rio Grande do Sul. Type from Guadeloupe.

Hypoxylon rubiginosum, (Pers.), Fr. Syll. I, p. 376.

Syd., 416, on wood, Kasauli; Dehra Dun; on Bambusa, Chittagong; on palm-trunk, Poona; on bark of Dalbergia, Sissoó, Pusa.—This European species was also found in N. America, S. America, Cuba, Ceylon, Java and Algeria.

Hypoxylon indicum, Syd., p. 416.

On branches, Pusa.

Daldinia concentrica, (Bolt.), Ces et D. N. Syll. I, p. 393.

Theissen, F. Bombayenses., p. 159, on trunks, Andheri; Syd., p. 417, on wood, Dehra Dun; Nagpur; Ootacamund, Nilgiris; Bulsar, Bombay Presidency; Cherrapoonji, Assam; Bilin, Burma; Pusa; Darbhanga pr. Pusa; P. Henn., F. Indiæ orient. II (Hedwigia 1901, p. 339), Saharanpur Garden.—Known also from Europe, Siberia, N. and S. America, Ceylon, Borneo, Tasmania, New Zealand.

Daldinia vernicosa, (Schw.), Ces. Syll. I, p. 394.

On wood, Europe, N. America, Algeria, Cuba, India.

Daldinia Gollani, P. Henn. Syll. XVII, p. 617.

P. Henn., F. Indiæ orient. II, p. 339, Siwalik Range, on rotten wood of *Ficus Carica*.

Kretzschmaria Heliscus, (Mont.) Mass. Syll. XVI, p. 449.

Syn.: *Poronia Heliscus*, Mot. Syll. I, p. 349.

On dead bark, Bot. Garden, Singapore.—Type from South America.

Kretzschmaria Kurziana, (Curr.), Cooke Syll. IX, p. 567.

Syn.: *Xylaria Kurziana*, Curr.

Grevill. XII, p. 3, on the ground, Calcutta.

Poronia Oedipus, Mont. Syll. I, p. 349.

Grevill. V, p. 16, on dung; Syd., p. 420, on horse dung, Pusa; known also from N. America, Java, Borneo, Australia.

P. Henn., F. Indiæ orient. II, p. 240, on horse dung, Saharanpur Garden.

Poronia arenaria, Syd., p. 420.

Under *Casuarina* trees, Chatrapur, Madras Presidency.

Poronia polyporoides, P. Henn. Syll. XVII, p. 620.

F. Indiæ orient. II, p. 340, on dead trunks and on the ground, Saharanpur Garden.

Camillea bacillum, Mont., Syll. I, p. 347.

Theissen, F. Bombayenses, p. 159, on bark, Khandala. Type from S. America.

Ustulina maxima, (Hall.) Schröt. Syll. I, p. 351.

Syn.: *Ustulina vulgaris*, Tul.

Hypoxylon ustulatum, Bull.

Sphaeria deusta, Hoffm.

Sphaeria versipellis, Tode.

P. Henn., F. Indiæ orient. II, p. 339, Saharanpur Garden.—Known also from Europe, N. and S. America, Cuba, Ceylon.

Ustulina tessulata, (Berk.) Cooke, Syll. IX, p. 542.

Grevill. XII, p. 3, on wood, Bombay.

Xylaria allantoidea, Berk, Syll. I, p. 314.

Syd., p. 417, on wood, Wahjain, Assam.—Known also from Brazil, Cuba Borneo, Ceylon. P. Hemmings, F. Indiæ orient. II, p. 340 mentions also *Xylaria obtusissima* (Berk.) Sacc. on dead stems, Saharanpur Garden; this species, if correctly determined, is identical with *allantoidea* (cfr. Theissen, Xylariaceæ austro-brasil., Denkschr. Acad., Vienna, 1910, p. 57, and Beit. Bot. Centralbl. 1910, p. 366).

Xylaria regalis, Cooke, Syll. IX, p. 530.

Grevill. XI, p. 86, on wood, Bot. Garden, Calcutta; perhaps merely a form of *X. plebeja* Ces. (cfr. Theissen l. cit., p. 58).

Xylaria plebeja, Ces. Syll. I, p. 318.

Syd. p. 420, on wood, Pusa. *Xylaria fistuca*, Berk.

Syll. I, p. 313, from Nepal is the same species (cfr. Theissen ll. cit.)

Xylaria salmonicoior, Berk, Syll. IX, p. 529.

On wood, Neilgherries.

[**Xylaria furcellata**, Berk, Syll. IX, p. 537.]

Grevill. XI, p. 88, Neilgherries. This species cannot be maintained, because quite undeveloped.

Xylaria dealbata, B. et Br. Syll. I, p. 323.

Theissen, F. Bombayenses, p. 159, Khandala, 4.

Xylaria Thyrsus (Berk). Sacc. Syll. I, p. 320.

On wood, Calcutta.—Known also from Brazil (cfr. Theissen ll. cit.).

Xylaria deserticola, Speg. Syll. XVII, p. 629.

Syd., p. 417, on roots of *Ficus*, Fraserpet, Coorg; on rotten wood, Pusa. Having identified Sydow's specimens myself, I could not find the slightest difference between his from India and my own from Brazil.

Xylaria involuta, Kl. Syll. I, p. 324.

On wood, Kala Panee; Khasia; [Ceylon; S. Amerika; Australia; New Zealand]. This species was described under various names from all tropical regions [*X. Telfairii*, *gigantea*, *tabacina*, *ventricosa*, etc.—cfr. Theissen ll. cit.]

[**Xylaria compuncta**, (Jungh.) Berk. Syll. I, p. 325.]

Reported from Khasia; also from Ceylon, Java. This species probably belongs to the *Hypocreaceas*.

Xylaria Gomphus, Fr. Syll. I, p. 316.

P. Henn. F. Indiæ or. II, p. 340, Saharanpur Garden in a subterranean cellar. Identical with the above mentioned *X. involuta* (cfr. Theissen l. cit.)

Xylaria Hypoxylon, (L.) Grev. Syll. I, p. 333.

P. Henn. l. cit., Saharanpur Garden; Syd., p. 418, Solebili, Balehonnur and Bargnai, Mysore. The species occurs all over the world (cfr. Theissen ll. cit.).

Xylaria aristata, Mont. Syll. I, p. 333.

Grevill. VIII, p. 96, Belgaum—Known also from Central America, South America and Borneo.

Xylaria Delitschii, Auersw. Syll. I, p. 336.

P. Henn. F. Indiæ or. II, p. 340, Saharanpur Garden. It is very doubtful whether the identification of this species, which is only known from Germany, is correct.

Xylaria digitata, (L.) Grev. Syll. I, p. 339.

P. Henn. l. cit. Mussoorie, Arnigadh—Known from Europe, Africa, North and South America, Java, Ceylon.

Xylaria pistillaris, (P. Henn.) Theiss.

Syn. : *Hypoxylon pistillare*, P. Henn. Syll. XVI, p. 446.

Syd., p. 416, on bark, Bargnai, Mysore.

[**Xylaria Carteri**, Berk. Grevill. XI, p. 88.]

Syn.: *Hypoxylon Carteri*, Berk. Syll. IX, p. 545.

On wood, Bombay.—Belongs to *Xylaria obovata*, Berk. (Cfr. Theissen, *Xylariaceæ*, p. 34.)

Xylaria scopiformis, Mont. Syll. I, p. 340.

Grevill. VIII, p. 96, Belgaum.—This species is only a form of the following :

Xylaria tuberosa (Pers.), Cke. Syll. IX, p. 537.

Syd., p. 420, on rotten wood, Bargnai, Mysore.—Type from the Sandwich Islands. On this species cfr. Theissen, *Xylariaceæ*, p. 8.

[**Xylaria escharoidea** (Berk.), Sacc. Syll. I, p. 316.]

Grevill. VIII, p. 96, Belgaum.—Type from Ceylon. Cfr. *Xylaria nigripes*.

Xylaria Emerici, Berk. Syll. IX, p. 528.

Grevill. XI, p. 86, Neilgherries.

Xylaria trichopoda, Penz. et Sacc. Syll. XVII, p. 633.

Syd., p. 420, Dehra Dun.—Type from Java.

Xylaria excelsa, Syd., p. 418.

On the ground (?), Narsinghpur, Central Provinces.

Xylaria heloidea, Penz. et Sacc.

Syd., p. 418, on branches, capsules and leaves of *Cedrela Toonæ*, Dehra Dun.—Type from Java; known also from Brazil. (Cfr. Theissen, *Xylariaceæ* . cit.)

Xylaria euglossa, Fr. Syll. I, p. 324.

Syd., p. 418, on dead wood of *Tamarindus indica*, Surat District, Bombay Presidency; on wood, Botanical Garden, Calcutta.—Type from Costarica; as *Xylaria turgida* from the Nicobar Islands; as *Xylaria*

australis from Australia; also common in Brazil. (Cfr. Theissen, *Xylariaceæ*, p. 57.)

Xylaria hypsipoda, Mass. Syll. XVI, p. 442.

On dead leaves, Singapore.

Xylaria Ridleyi, Mass. Syll. XVI, p. 443.

On dead wood, Botanical Garden, Singapore.

Xylaria aspera, Mass. Syll. XVI, p. 444.

On rotten wood, Selangor.

Xylaria nigripes, Kl. Syll. IX, p. 527.

Syd., p. 419, on the ground, Dehra Dun; Koppa, Mysore; Jullundur; Pusa; Dhulia, Bombay Presidency. *Xylaria peperomioides*, P. Henn., reported by Hennings (F. Indiæ Orient. II, p. 340; Syll. XVII, p. 622) from Saharanpur, is the same species (Cfr. Syd. l. cit.); other synonyms are: *Xylaria Gardneri*, *Xylaria escharoidea*, Berk., *Xylaria piperiformis*, *Xylaria mutabilis*, *Xylaria flagelliformis*.—Known from East India, Ceylon, Java, South America.

(To be continued.)

MORE BIRD NOTES BY THE WAY IN KASHMIR.

BY

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The following notes are supplementary to and in amplification of "Bird Notes by the Way in Kashmir" published in Vol. XXI, No. 2, of this journal. In these latter I expressed the hope of being able to revisit my leave haunts, of last year, in the breeding season. That wish has been partly gratified for I reached Sonemurg this year (1912) during the second week in June. Hopes and anticipations with which I set out to ornithologize on arrival were on the whole, I must confess, not realized, and no startling discoveries fell to my lot.

Sonemurg, with which locality these notes are mainly concerned, lies at an elevation of 9,000 feet and over, is well in the interior of the Himalayan region, and consequently is practically under snow till the middle of May, and it surprised me therefore to find the breeding season already well advanced when I arrived there. Many species had young, well feathered, in the nests, and of some species these were on the wing.

References in these notes are to the above named publication except where otherwise stated.

On the Jhelum Valley cartroad near Dulai at an elevation of barely 2,000 feet I passed a midday, the 29th of August, a flock of young Jackdaws, *C. monedula*, with bills wide agape feeding on the roadway. At this time of year in the narrow gorges, through which the Jhelum flows at this spot, the temperature of the air, owing to the confined space and to radiation from the rocky surroundings, may be anything, from 120 Fahr. and upwards, at midday, and bears comparison with the conditions obtaining at the same season in Dera Ismail Khan or Jacobabad. Yet at this same moment similar flocks of young daws were disporting themselves in the cool breezes of Sonemurg, 150 miles to the north-east. Truly the vagaries of individuals of a species as regards distribution and relative temperatures are wonderful.

The Chough, *Graculus erimeta*, is supposed to derive its name from its note. But the note is much more like the syllables "Chee-o kah" pitched high and squeaky. There is also the common note like "Khew" which has been recorded of this species in England. The young after leaving the nest and when clamouring to be fed make a loud plaintive squeaky mewling note.

The Himalayan Whistling Thrush, *Myiophonus temminckii*, often utters its loud whistling song when on the wing.

Nests of the Kashmir Wrens, *Anorthura nepalensis*, found at Sonemurg were all built in holes in birch trees, one nearly 10 feet from the ground.

A large brown Warbler with a long bill seen at Sonemurg on August the 9th among the dwarf elders and rank weedy growth on the flat ground across the Sind river, where it had a concealed brood of fledglings, was (I feel safe in identifying it as such in spite of its resemblance to some of the *Acrocephali*, and especially as a nest of the species was taken in this very spot a few years ago by Colonel K. Buchanan). "The Large-billed Bush Warbler" *Tribura major*. This Warbler when imagining its young in danger clings to the top of a tall plant to survey the intruder, and utters a loud alarm note, which, if a double "r" could be added to the sound, would be exactly reproduced by the knocking together of 2 large pebbles.

The similarity in habits between Pallas' Willow Warbler, *Phylloscopus proregulus*, and the Goldcrest, *Regulus cristatus*, is very marked. Both flutter in the same manner at the ends of fir branchlets when picking insects therefrom. But the Goldcrest perhaps creeps more and hunts less on the wing than the Warbler. From the latter he is, from below, most easily distinguished by his beady black eye set in the plain greyish white expanse of the side of the head and cheek.

Nests of the Sooty Flycatcher, *Hemichelidon sibirica*, in Sonemurg were beautifully neat little structures of moss and cobwebs lined with goats' hair. All were placed on branches. Some near the trunk, others well out on the branch. Some were high up near the tops of the trees, others only 20 feet or so from the ground. The Birch, the Sycamore, the Bird Cherry, and the Himalayan Silver Fir all seemed to be equally selected as nesting sites.

The Rufous-tailed Flycatcher, *Alseonax ruficaudus*, has a loud melodious song. Some of the notes indeed are remarkably loud for the size of the bird. The song is not continuous but consists of warbles and whistles interrupted by the bird's flittings to catch a fly, or pick an insect off a leaf, the stem of a tree, or, rarely, from the ground. Some notes closely resemble those of the Indian Blue Chat, *Larrivora brunnea*. A characteristic part of the song may be syllabified as "Tyee-trrirr, trirr tee." Amongst others notes frequently heard sound like "Weetitew," "Ee-willu willu" and "Choi choi." Occasionally there is a loud finch-like "Twoink twoink". All notes are rapidly repeated. While singing the male rarely stays for more than a few seconds in one spot and as he prefers a leafy tree, for choice the Birch, *Betula utilis*, and is at the best of times not a conspicuous bird, coupled with the exasperatingly ventriloquial character of the song, he is exceedingly hard to pick up and follow by eye. Indeed during the breeding season this Flycatcher but for its loud song may be considered to be of a retiring disposition. The male is a hopeless guide to follow in search for nest and eggs. He wanders over a large area of open forest while singing and at times may be found thus, perhaps 300 or 400 yards from the nest.

Days and hours spent by me in searching for a nest met with no success. I came to the conclusion that this Flycatcher must have been breeding high up in the silver firs, *Abies webbiana*, than which trees none are more difficult to spot the nests of small and inconspicuous birds in. But one day long after I had ceased to devote exclusive attention to these birds, my woodcutter coolie, who had orders to report any nests he found, informed me that he had found one of sorts. Proceeding to the spot I saw a small nest from which the young had evidently flown, situated about 10 feet from the ground in the fork of a branch of a small silver fir in forest. Built of moss and grass, it was deep and cup-shaped, and densely lined with feathers. My knowledge of the birds of the locality combined with a process of elimination and, above all, reference to a published description of nests of the present species (Stuart Baker, Ibis Vol. VI., No. 22, p. 279) with which it tallied, led me to the conclusion that I had at last, only too late, found what I had so long sought.

As remarked (*ibid*) the Rufous-tailed Flycatcher does not make sallies from a selected perch when capturing its prey, but flits from branch to branch. In disposition it is pregnacious, chasing away other small birds that come near it. Especially intolerant does it seem of the Himalayan tree-creeper, *Certhia himalayana*. It was not numerous in Sonemurg and pairs did not breed near each other as in the case of *H. sibirica*.

Like Mr. S. L. Whymper I too found a tree nest of the Plumbeous Redstart, *Rhyacornis fuliginosis*. This was over 20 feet up, and built in a crevice in the stem of a silver fir.

The Red-flanked Bush Robin, *Ianthia rufilata*, is to the nest hunter in these forests what the Ruddy Sheldrake is to the Duck Shooter on our Indian Rivers, namely, an unmitigated nuisance, for its loud harsh scolding or alarm note puts every little bird within 100 yards radius on the *qui-vive* and all come to see the trouble and take warning accordingly.

In different localities songs of males of the same species differ, and often to a considerable extent. For instance up the Sind Valley, at about 7,000 feet, the song of Tickell's Ouzel, *Merula unicolor*, which, in the Kashmir Vale below, is a monotonous repetition of a few notes, was here much more varied and melodious. So much was this the case that on occasions I was led to stalk a singing Thrush not recognising it from the song. In every case it proved to be of the present species.

The low pitched musical call note "Tew" followed by a quickly repeated "Tewtya" is quite characteristic of "The Orange Bullfinch," *Phyrulla aurantiaca*, and will, even midst a variety of forest sounds, always indicate the presence of this bird. By imitating the note it is not difficult to bring the bird into one's immediate presence. I used often to call a male into a tree by my tent, where he would sit and sing lustily, and I once called him down on to my tent ropes. The song as mentioned (*ibid*) sounds "metallic," but

it may be still better described as consisting of a series of very rapidly repeated low flute like notes. No two males sing quite alike, although the pitch or tone is the same in every case. For my own edification I syllabified many variations of the song, and so well acquainted did I become with pairs of these birds that I was able to differentiate between them on hearing the male sing. The impression received from the song of the male, mentioned above, when not heard too close, may be well conveyed to the ear by a rapid repetition of the words "Give the devil his due"—"Divil a bit."—This uncharitable sentiment, let us hope, was not really endorsed by the bird!

The staple food in summer appears to be buds and catkins of the Himalayan Birch (*ibid*), but early in the season it was not uncommon to see pairs hopping about on snow patches in forest picking up minute seeds left on the surface of the melting snow. A curious feeding habit late in summer was the pecking and swallowing of mouthfuls of a very fine grained dry yellow clay which filled in the archways of the roots and the hollow bases of individual old silver Fir trees. Within four yards of me I watched a pair gorge themselves on this stuff for fully ten minutes and then fly away down hill to where I suspected there was a nest but which I never found. If such there was then this nesting was well below 9,000 feet. The clay in question probably contained food properties essential to the young which were doubtless fed on it by regurgitation. A rough analysis however failed to reveal any seeds, insects, or grit and to the taste it was insipid.

I spent many days in forest and on hill side at various elevations searching for the nest. Colonel Ward's description of the locality in which his collectors took these puzzled me considerably for it was only between 9,000 and 10,000 feet, rarely over, that I could be sure of meeting with this species. Above 10,500 feet there was never a sign of the birds. They were in fact left below. This was my experience both in the Liddar and Sind valleys (*ibid*). I have little hesitation therefore in asserting that 11,000 feet is the maximum elevation at which the Orange Bullfinch will be found in Kashmir. A very short acquaintance too with its habits suffices to shew that like its European congener it is a woodland species. Searching for nests therefore on open bush clad hillsides at 12,000 feet and over which is above the tree limit in these parts, was anything but profitable and I soon abandoned it to confine my attentions to the forests below frequented by the birds. My reward eventually followed in the discovery of a nest on 28th July.

On the 27th I observed a pair of Bullfinches in a strip of forest at a spot just about 10,000 feet above sea level. The action of the female clearly indicated that she contemplated domesticity. But after hopping about in the lower branches of a silver fir and occasionally giving a half-hearted tug at a twig or piece of lichen she and her mate, to my chagrin at the time, disappeared into the forest, and although the notes sounded at intervals did

not return to the spot. Determining to watch the place, however, I returned there next day and was gratified on arrival to see the flash of two white rumps as a pair of Bullfinches startled from the ground simultaneously disappeared into a thick tree. A few moments and they were back again, and to my delight the female picked up a twig and flew behind the trunks of some silver firs. Shifting my position, so as to watch the direction of her flight, I saw her return, pick up another twig, and dive with it into a low, tangled, and drooping branch of a medium sized silver fir. For some time I watched through glasses the process of building. Twigs were the only material used during my vigil. It was interesting to watch the manoeuvres to get an extra long one into position. This would be first pushed into the branch by one end while she, going round to the nest side, would from there pull it through and deftly weave it into place. Not



The cross marks site of nest of Orange Bullfinch (*P. Auran-tiaca*)—nest about 6 feet from ground.

daring to go nearer for fear of disturbing the pair I left the spot quietly, deciding to return a week later when I hoped the full clutch would be laid.

On the 4th of August, accompanied by Colonel K. Buchanan, I revisited the spot. We found the female on the nest and sitting very close. Three people walking about immediately below did not disturb her and it was not till I almost had my hand on her that she flew off. My astonishment was considerable therefore on examining the nest to find only one egg and that fresh! The situation was puzzling but on Buchanan's advice the nest was left till the 8th August. On arrival at the nest on this date the female was not "on" but appeared a moment or two later with the male and at once flew to the nest. She sat for half an hour or more when the male, returning, called her off. Being satisfied that she was sitting in earnest this time I took the nest and the 3 eggs which it

contained. While removing these both birds reappeared close above me uttering the 'tewtya' note.

The eggs were blunt ovals measuring about $.75 \times .56$ and in other respects were more or less similar to those described by Colonel Ward, mine being white fairly densely speckled with reddish brown with superimposed purplish brown spots in a zone round the larger end. The shells were somewhat fragile, smooth, and fine grained in texture.

The nest though smaller was not unlike that of 'The European Bullfinch.' A platform of twigs on which was built a shallow cup of fine rootlets and a little dried grass. A few goat hairs completed the lining.

The close sitting of the female on the 4th August was decidedly strange. She could hardly have been incubating, for although some birds are known to commence this from the laying of the first egg, notably species that lay early in the year and in exposed situations, the Bullfinches are not of this group. I can recall too the fact that on this date she was not sitting down into the nest as she was on 8th August when only the top of her head was visible to one standing by it. The only explanation of her behaviour on the 4th that occurs to me is that she was in the act of laying as we arrived. This was about 8-30 a.m. As she was not kept more than quarter of an hour off the nest on this occasion I am inclined to be sanguine that she had time to get back to lay her egg and did not drop it outside in her extremity.

August nests must, I imagine, be second broods. From the second week in June, when I first met with these Bullfinches, they were always in pairs and the males singing vigorously. Moreover in the beginning of August I came across parties of 3 or more. One party was for certain a pair with 1 young. This latter had been out of the nest for some time as it was exactly like the female and the male kept hunting it away when it persisted in following him. It was not till June the 28th that I first saw signs of nesting when I observed a female with a twig in her bill, but as she flew far away with it I never succeeded in locating the nest.

Like the European Bullfinch, this species is secretive at nesting time only, choosing for the nesting site the quietest and remotest corner of a wood within the limits of elevations given. As far as I could gather the densest portion is not selected, but parts more or less on the level are preferred.

The Orange Bullfinch is a charming little bird in every way. The affection with which the male treats his partner is quite pretty to watch. Rarely does he let her out of his sight, and while she feeds, drinks, or bathes he is never more than a yard or two away seemingly too utterly absorbed in admiration of her charms, to follow suit, and constantly bursting into his melodious little song. While *she* builds the nest *he* sits on a twig close by, now and again looking to see how the work is progressing,

though never, I fear helping, and occasionally hopping up to give her a kiss by way of encouragement.

That these Bullfinches pair for life is I imagine more than probable.

The Rose Finch, *Carpodacus erythrinus*, was fairly numerous in Sonemurg up to the beginning of July. It doubtless nested there, and at no great elevation either.

I must qualify the statement (ibid) regarding the partiality of the Red browed Finch, *Callacanthis burtoni*, for dark forest situations. This is only partly correct. Although essentially a woodland species and, when actually nesting, a forest bird, yet when the young are fledged, it often ventures into open situations, though never away from the vicinity of trees. Much of its time is spent in searching for food on the ground. It is a wonderfully tame species and often in the early morning a family party would peck for food round the door of one's tent.

Contrary to the impression received last year I find these birds to be early breeders. Fully fledged young were on the wing by the 3rd week in June if not before. The young have the head uniform brown and show no coloured brow or supercilium. There is little doubt that two broods are usual, though I failed to observe a nest.

The common note of this species (ibid) may perhaps on a close acquaintanceship, be better rendered by the syllable 'Pweee'*. This is often followed by notes like 'Pwen' 'Pweueu' or 'Chipeweu'. The 'eu' pronounced as in the French. All notes are plaintive and melodious.

The Himalayan Goldfinch (*Carduelis caniceps*) nested commonly in isolated fir trees about the "Murg" and young were fully fledged by the third week in July. The young have the head uniform grey brown, the red and black mask of the adult probably not being assumed till after the autumn moult. It was a pretty and familiar sight to see flock of "Goldies" flying about the "Murg" fluttering at the thistle and dandelion heads. But only a short time do they stay at the nesting elevation, and by the end of July most have left for the lower valleys. The notes do not differ from those of the European Goldfinch.

* It might be imagined that the conformation of a bird's vocal organs, viz., syrinx, palate and bill, would preclude the possibility of its producing any sound commencing with the letter 'P' as made by human lips, but it is remarkable how often bird's notes can only be correctly reproduced by syllables commencing with this letter. As regards the present species this is very much the case. I have listened to the notes at a distance of 3 yards only and no other initial letter in the syllable could so well convey the sound to the human ear. It may be that in the vocal apparatus of some birds an action, analogous to that of human lips when pronouncing the letter 'P' takes place when air, in giving utterance to a note, is expelled through the syrinx, the contiguous surfaces of the back of the tongue and the soft parts of the palate taking the place of lips.

On the 10th of June at Gund, 14 miles below Sonemarg in the Sind Valley, I saw large flocks of Gold-fronted Finches (*Metaponia pusilla*) on the open hillsides. This finch, like "Stoliczka's," seems to keep in flocks throughout the breeding season. The call-note is a twice quickly-repeated note like 'chup'. It did not occur in Sonemarg.

The 39 miles of cart road running through the rice fields of the Vale of Kashmir from Baramulla to Srinagar is bordered on either hand by a monotonous row of tall poplars planted close together. In the breeding season every third or fourth poplar holds a nest (bulky, untidy structures of grass), some hold four or more. These are nests of the migratory sparrow (*Passer domesticus*) mentioned (*ibid*). The number of nests along this stretch must run into thousands. But this is only a very small portion of the breeding area of this sparrow in Kashmir. The origin of the vast hordes of sparrows, which descend upon the cornfields of North-West India during the spring passage and hurry through to Central India in autumn, is thus partly revealed. If not a blessing in disguise to the Kashmiri zemindar (as it is a curse and curse only to the farmer of the plains of North-West India) this sparrow at any rate compensates him for any damage done to the rice crops later in the summer by the prodigious quantities of green caterpillars which it destroys to supply the needs of the young in the nest.

Breeding, as described, along a roadway on which there is a considerable traffic, these birds are afforded protection to a great extent from their natural enemy the Sparrow Hawk (*Accipiter nisus*). But they have one enemy which nests among them and has no fear of the traffic, namely, the Rufous-backed Shrike (*Lanius erythronotus*). That this shrike takes a heavy toll of the sparrows in the shape of young is pretty certain. Indeed, I believe the Rufous-backed shrike to be somewhat addicted to sparrow fare, as wherever sparrows occur in numbers either nesting or roosting, in this part of India, this shrike is pretty sure to be common. A good illustration of its propensities in this respect was afforded me one November afternoon while standing in the club verandah at Nowshera. Over the porchway was a heavy creeper in which sparrows roosted in numbers. While these were noisily settling down for the night a shrike of the above species darted in, took a sparrow, and flew with it to a small tree a few yards away. The fortunate observers of this incident attracted others to the scene, and the strange spectacle was witnessed of a shrike breaking up and devouring his quarry while perched on a small branch some 6 feet or so above the head of the big drummer of the band of an Indian regiment which was playing at the time on the club lawn. Evidently this particular shrike appreciated music at his meals.

Nesting colonies of the above migratory race of *P. domesticus* also occur in Peshawar. In remote corners of this district away from villages n

small jungles and rukhs I have found tamarind thorn trees full of such nests.

A curious instance of a double nest was that of an Eastern Meadow Bunting (*Emberiza stracheyi*) which had built, under a stone, two nests along side of one another. One of these was empty, the other contained four young.

The Crested Bunting (*Emberiza melanicterus*) was quite common on the Murree-Srinagar tonga road between Dulai and Uri. The bird was often to be seen singing perched on the telegraph wires.

In company with a few Snow Pigeons (*Columba leuconyx*) which had their nests in holes in the limestone rocks of the famous pilgrims cave of Amarnath (13,000 feet) was a small colony of Kashmir House Martins (*Chelidon kashmiriensis*.) A further instance of the desolate wild and



AMARNATH VALLEY (13,000), where the famous pilgrims cave is and in which the Kashmir Martin (*C. kashmirensis*) was found breeding. The bottom of the valley is all snow. Taken Aug. 16.

elevated regions to which these Martins resort for breeding purposes in some parts of their range.

On the 30th June a friend, when descending a hill above Sonemarg, disturbed a bird nesting on the ground at about 11,000 feet. The nest contained four eggs which he described as dull whitish in colour and fairly densely speckled with brownish purple. Two days later we visited the spot together and found the eggs hatched and four young in the nest. I watched the female on to the nest and got a close view of her through glasses. From the broad bold streaks on the breast, the comparatively small amount of white visible in the tail in flight and the light flesh coloured legs I

feel sure that the bird was the European Tree Pipit (*Anthus trivialis*), which was so common here last year at the end of August. The nest was in a hollow under a sod on the hillside and was built of dried grasses. It was situated within 20 yards of a small clump of birches into which the parent bird always flew on being disturbed.

A nest of Hodgson's Pipit (*A. rosaceus*) containing four eggs, which I found four days later about 1,500 feet above on the ridge, and under a stone, was composed of exactly similar material.

The Long-billed Horned Lark (*Otocorys longirostris*) when disturbed, rarely takes flight immediately, but runs in front of one with a slight waddling gait which reminds one of a miniature chikor. This lark was fairly common on open grassy hilltops at 14,000 feet and over.

The Cuckoo (*Cuculus canorus*) occurred, but was rare, in Sonemarg. The last date on which the call was recorded by me was July the 18th.

I failed to discover—and not for want of searching—the author of a very loud monosyllabic note which was uttered twice comparatively slowly and then three or four times rapidly, the whole being repeated several times with an attempt at rhythm. I first heard it about 14 miles below Sonemarg in the Sind Valley late in the afternoon and again the following morning. At Sonemarg it appeared to be uttered at night only usually between 2 and 4 a.m. My first impression was that it was a note of some Laughing Thrush with which I was unacquainted. But not having met with any birds of this genus, I eventually abandoned this idea and came to the conclusion that the Large Barred Owlet (*Glaucidium cuculoides*) must be the author of the sound. The note could be heard some hundreds of yards away, but was exceedingly difficult to locate.

Scully's Wood Owl (*Syrnium biddulphi*) was the common owl in Sonemarg. Indeed this was the only owl I met with. It was often to be seen perched at the entrance to a large hole in some gnarled old sycamore in forest. Some of these holes, especially those under which I found pellets, were searched, but failed to reveal a nest in being. As I did not come across the bird till after the middle of June the young may have flown, but I have little doubt that it was in such situations they nested.

About an hour before dark this owl wakes up and gives its quadruple cry—a loud "Hoo—Hoot tu whooo," an impressive sound at dusk in these high Himalayan forests. The pause after the first syllable is very marked.

Only occasionally in the breeding season was the 'hoot' given during the actual hours of darkness, but with a waning moon it was often to be heard an hour or so before dawn. Later on in the summer the young owls were often very noisy at night. For some days, whenever an owl, which haunted a bit of wood close to my camp, uttered its note at dusk it was immediately answered by another in a slightly higher key. At times the two hoots would sound simultaneously and whenever this happened the

higher-pitched note invariably upset the cadence of the lower, the effect being quite ludicrous. Whether this was a rival, a mate, or a young "Scully" getting his first singing lessons I never discovered. When flying about at night a note repeatedly uttered by these owls sounded like "Khawak."

From an examination of the disgorged pellets it appeared that the principal food in the breeding season consists of small rodents of the *Micromys* and *microtus* genera which abound in these forests. Occasional pellets showed bits of the wing cases (*elytra*) of beetles. I saw no remains of birds. One method of hunting at dusk is as follows:—The owl flits silently to the horizontal trunk of a birch or other tree (at these elevations, 9,000 ft. and over, trees on any slope, owing to the pressure of snow in winter issue horizontally from the soil before they curve up vertically) under which it has marked down the hole of a mouse or vole and there remains motionless. As the little rodent cautiously creeps forth in search of food there is a swift pounce and the owl gets the *entrée* of his supper.

Some writers on Natural History affirm that the "Hoot" of an owl is a hunting cry which they suppose terrifies small birds and mammals into movement so enabling the owl to locate and swoop on them. In the case of the present species the cry, by twilight at any rate, was certainly not used for this purpose for it was generally uttered from the top of a high fir tree on rising ground and repeated often for ten minutes at a time.

Like most members of the family pairs of these owls have their own hunting preserves into which no other individuals of the species are permitted to enter. Three separate patches of forest around Sonemarg each held its own pair of Scully's Wood Owls.

The graceful flight and hover of the Kestrel (*Tinnunculus alaudarius*) was occasionally to be seen over the "Murg." Twice I observed a Kestrel stoop at and give chase to small birds in best approved peregrine style. On the first occasion the quarry was a Grey Wagtail (*Motacilla melanope*) at which constant deadly stoops were made, the wagtail only just escaping by flying into a fir tree. The second instance was the stooping at and chasing of a flock of Stoliczka's Mountain Finches, but in this case it was probably play only.

PROGRESS OF THE MAMMAL SURVEY.

Since July, when the last editorial note on the progress of the Mammal Survey appeared, work has only been proceeding slowly. This is inevitable in India where, owing to the rainy season prevailing from June to September inclusive, it is almost impossible for field work to continue during these months.

Mr. Crump left Chanda, C. P., in July when the rains set in and returned to Bombay. He is now in Kathiawar and will afterwards probably work Guzerat or Rajputana.

Mr. Shortridge after leaving Shimoga made an expedition to Bellary District where at Humpi (the ancient city of Vijayanagar) he camped and collected vigorously for some weeks. He obtained some 331 specimens there, and the old ruins and temples contained a large number of bats. From Humpi he proceeded to Bangalore and from there to Kolar in the east of Mysore State. He has just left that for Cauvery (Seringapatam) and Mysore after which he goes to Coorg and the West Coast—where the rains will then be over—on his way to the Nilgiris and S. India.

The Committee hope that members residing in districts visited by the Mammal Survey collectors will send in specimens of any animals of which only one or two or no specimens have been obtained by the collectors.

In the Nimar report (p. 844, No. 3, Vol. XXI) it will be seen that very few skins were collected of certain animals and it is most desirable that further specimens should be procured, more especially of the Langur, the Deccan Spiny Mouse and Phillips' Spiny Mouse. Also a considerable number of species, which are almost certain to occur in the district, do not appear in the report as having been obtained by the collector and to make up these deficiencies the Society will be glad to obtain skins and skulls of the Bengal monkey, the smaller bats, flying squirrels, Bandicoot rats, Blanford's rat, porcupine, four-horned antelope, mouse deer, pigs, &c. Though no specimens of the Tree-Shrew (*Tupaia*) were caught either in this district or the Berars (*vide* report, p. 820, No. 3, Vol. XXI) it is in all probability to be found and skins are much wanted. The report on the Dharwar collection appearing in this issue is more complete, but nevertheless as will be seen more specimens of certain kinds are wanted and also of the few which although found in the district were not obtained by Mr. Shortridge.

As our special collectors can only visit a particular district at one time of the year, it will be obvious that it is almost impossible to obtain specimens of *every* animal found in that district—as at one season some animals will be more difficult to procure than at another season—and it is in this way that our members who are residing in that district can help the Society by filling in the blanks.

Skins and skulls from *all* districts of the different kinds of big game are also much desired, more especially so as our collectors do not try to obtain the larger game animals except when opportunity offers

All skins should be accompanied by their skulls and if possible by the following simple measurements; head and body, tail, hind foot and ear, and a label giving locality, sex and date, should be affixed to both skin and skull *which should only be roughly cleaned*.*

Besides specimens we should be glad to receive from members any notes on the distribution, habits, local names and folklore of the different animals in their district. It is hoped that members will co-operate and help with this information so that the Mammal Survey may not only result in a collection of properly labelled and worked out specimens showing the species and their distribution in India, Burma and Ceylon, but also in the bringing together of information of all sorts relating to their habits.

As regards finance, members will be glad to learn that we have received valuable help from the Government of Bombay (Rs. 2,500), the Government of the United Provinces (Rs. 2,000), the Government of India (Rs. 7,500) and Mr. Ratan Tata, a second donation (Rs. 1,000) and the total sum obtained and promised now amounts to Rs. 42,992-8-6 whilst up to date we have spent about Rs. 17,877-11-4.

The Committee feel, however, that a third collector is absolutely necessary if the survey is not to be prolonged for several years. The magnitude of the task is becoming more evident as the survey progresses. India, Burma and Ceylon cover such an enormous amount of ground that if the survey is to be thoroughly done, a third collector to start at the southern boundary of Burma to work northwards is extremely desirable at once. It is estimated that a sum of Rs. 15,000 to Rs. 20,000 will be required to bring out a third collector for 2 years to work Burma. The Government

* A pamphlet on the skinning and measuring of large and small mammals can be had from the Honorary Secretary on application.

of India have promised Rs. 7,500 as mentioned above and Mr. Ratan Tata has kindly promised another donation of Rs. 1,000 towards this object *on the understanding that the rest of Rs. 7,500 is obtained and the object carried out.* The Committee therefore hope that the balance may speedily be obtained, so that the provision for the other two collectors may not have to be dipped into.

At the same time it will be noticed that the subscription list this time includes very few members' names and it is earnestly hoped that members will not lose their enthusiasm for the scheme in consequence of some Governments having given the Society a helping hand.

Small annual subscriptions towards the Mammal Survey Fund will be very acceptable as the work cannot be carried through thoroughly unless a good deal more money is forthcoming.

MAMMAL FUND.

FURTHER LIST OF SUBSCRIBERS UP TO 30TH SEPTEMBER 1912.

NAME.	Amount.		
	Rs.	A.	P.
Amount previously acknowledged in Journal No. 3, Vol. XXI	27,255	15	0
BOMBAY GOVERNMENT	2,500	0	0
Burke, Capt. H. F.	51	9	6
Evaus, Col. G. H.	45	0	0
Fletcher, T. Bainbrigge	50	0	0
Holden, Major H. N.	15	0	0
Howell, E. B.	15	0	0
Milner, C. E.	15	0	0
MADRAS GOVERNMENT	2,500	0	0
O'Donnell, O.	5	0	0
Suter, Dr. M. F. (Rs. 10 per month for June, July, August and September)	40	0	0
UNITED PROVINCES GOVERNMENT	2,000	0	0
Rs. ..	34,492	8	6
<i>For a third Collector.</i>			
Promised by THE GOVERNMENT OF INDIA Rs. 7,500			
„ „ Mr. Ratan Tata (2nd donation) 1,000	8,500	0	0
Total Rs. ..	42,992	8	6

MISCELLANEOUS NOTES.

No. I.—TIGER (*FELIS TIGRIS*) KILLING AND EATING ITS YOUNG.

I have often wondered how it is that I have seldom found more than two and never more than three cubs with a tigress although on two occasions when I have been so unfortunate as to shoot a pregnant tigress I have found as many as five unborn cubs inside her. Until a short time ago I accounted for this with the theory that possibly the tigress eats some of her cubs soon after they are born—a habit not unknown with other animals I believe.

Recently however I have come to change my views.

On May 20th I had joined camp with Mr. Symes who was shooting in this district. A tiger, a tigress and two cubs were known to be about and the previous night and in the very early morning the rather unusual roar of a tiger was heard for some time. In the direction of the roars a prepared kill had been taken by a tiger and later about a mile beyond this kill a natural kill of a sambur by a tigress was found. We decided to beat over the artificial kill first. The beat was blank the tiger having gone out of the beat beforehand towards the other kill. The beaters however found two dead half-grown tiger cubs in the beat which had clearly died in the evening before.

We examined these dead cubs and found that they had been killed by a male tiger and both of them partially eaten at the haunch. They had both been killed in the same place but one of them had been dragged some hundred and fifty yards from its dead companion. It was interesting to see that the cubs besides being rather severely bitten in the throat had been much clawed in the arm pits, in fact sufficiently so to alone cause their death.

Local natives, who certainly ought to know something about tigers, say that a male tiger will always kill cubs if he comes across them, and after this interesting experience one can well believe it. In this particular case the tigress had probably left her cubs early in the evening and killed the sambur. While she was busy with this the tiger probably came across the cubs on his way down to the water where the kill was. After disposing of the cubs he must have gone for a drink and killed the bait tied up for him. The roars we heard were probably those of the distressed mother and perhaps it was well that she was not in the beat.

Mr. Symes also corroborates the facts of this story.

JAMES W. BEST, I. F. S.

BILASPUR, C. P., 6th July 1912.

[In Vol. VII. of our Journal (1892), page 253, we published a note by Colonel Scott of Palanpur, on "Tigers eating their young."—EDS.]

No. II.—CANNIBALISM AMONG PANTHERS (*FELIS PARDUS*).

About a week ago I had three panthers, said to be a large male, a female and a small male, marked down in some dense thorn jungle chiefly *can-*
delabra cactus and *babul* not many miles from Veraval.

The jungle was far too close to beat, so I tied up a live goat and sat over it in a *machan* about 6 P.M. A medium sized male panther came at 6-30 and I hit him hard with a 500 express bullet. He turned and jumped back into cover, and, on examining the spot, I found a piece of lung on a stone, and a thick trail of light-coloured frothy blood leading into the thick thorn jungle. I knew then that he was hit through the lungs and could not go far, so I decided, as the cover was so thick, to leave him till next morning. In the morning I found him lying about 50 yards away the other side of a thick clump of cactus through which he had dragged himself. Imagine my disgust to find that he had been more than half eaten and the skin of course ruined. The head, chest and forelegs, hindlegs, tail and part of the rump were untouched, the rest of him was eaten, the ribs bitten off close to the spine.

All round were the footmarks of the female and the small male, so there is no doubt that they had made a square meal of their dead relation. There were no signs of jackals or hyenas. The dead panther had very large pads, and this accounted for his being described as a large male though as a fact he was only a medium size.

I remember reading of a similar case in a previous note in our Journal, but I believe such cases to be sufficiently rare to make this one worth noting.

J. R. CARTER, MAJOR,
Bombay Political Department.

CAMP VERAVAL,
7th June 1912.

[Cases of this kind have already been recorded both amongst tigers and panthers in Vol VI. and XVII of this Journal.—Eps.]

No. III.—NUMBER OF A PANTHER'S (*FELIS PARDUS*) CAUDAL VERTEBRÆ.

In my notes in the last number of the Journal on Mr. Hick's book "Forty years among the wild animals of India" I referred to his statement that two species of panther are distinguishable, among other differences, by the 'fact' that the large 'species' has only 22 vertebrae in the tail while

the smaller has 28. It is of interest therefore to record that in April last in the Mahi Kantha Agency I shot a female panther measuring 6 feet 2 inches (including tail of 2 feet 7 inches) the number of whose caudal vertebræ on careful examination proved to be 24. As a single instance is insufficient to dissipate what I believe to be a myth, it may be hoped that others will be reported by members of the Society.

A. H. MOSSE, CAPTAIN, I.A.

PALANPUR,

23rd July 1912.

No. IV.—NOTES ON MARTENS IN KASHMIR.

Toiling up a moraine one afternoon with a friend at Sonemurg and when at an elevation of about 11,000' he suddenly gave a low whistle from behind me and beckoned me to his side. There not five yards from us appearing from beneath a rock was a fine example of The Beech Marten (*Martes foina*). The animal did not appear much disquieted by our presence, continuing to sniff and gaze around, till one of us made a slight movement when it withdrew beneath the rocks. We waited some time for its reappearance but it evidently decided to stay at home, or had slipped away by a hidden passage beneath the moraine.

Imagining that we had found the entrance to its lair my friend a few days later set up a camera and waited on the chance of securing a photo, but there was no further sign of the Marten, only a few mouse hares appeared from beneath the same rocks and played about. Later on I went up to try my luck with a gun and to endeavour to secure the Marten as a specimen. But I waited in vain and had to contend myself with a mouse hare which came out *at the same spot as the marten had*. The presence of these mouse hares rather upset the theory that we had discovered the Marten's lair, and we came to the conclusion that, when we saw the latter, it was hunting, and had been prospecting the mouse hare burrows under the rocks from beneath which we saw it emerge. It is hardly likely that a Beech Marten and mouse hares would live amicably side by side. The biblical "Lion and lamb" miracle would be quite eclipsed by such a state of affairs.

In the same locality, the Indian Marten (*M. flavigula*) frequented the forests just below.

H. A. F. MAGRATH, LIEUT.-COLONEL.

KASHMIR, July 1912.

No. V.—NOTES ON THE TIME OF APPEARANCE AND
FLIGHT OF EASTERN BATS.*

Time of appearance.

Flight.

<i>Pteropus</i>	early (well before sunset).	High, slow and heavy (rook-like) occasionally soaring for short distances.
<i>Cynopterus</i> (including all other small fruit bats.)	late (well after sunset).	Low, compared with <i>Pteropus</i> , comparatively quick and fluttering.
<i>Rhinolophus</i>	late	Low and fluttering.
<i>Hipposiderus</i> (small).	frequently early.	High, although not particularly swift (Java, New Guinea, etc.)
<i>Megadermatidae</i> ..	very late ..	Low swift fluttering.
<i>Pipistrellus</i>	early	Larger species swift, smaller species (including <i>Tylonycteris</i>) very erratic in flight. The larger species generally fly high, the smaller are variable.

[This is true, but I have several times seen them in swarms before sunset when white ants were swarming after first rain—R. C. W.]

Scotophilus early High, swift.

Harpyiocephalus! early High, slow and heavy.

(*Hesperotenus*?)

[I am not sure of this identification but all specimens entered in lists as *Harpyiocephalus* were *Hesperotenus*—R. C. W.]

<i>Plecotus</i>	} late	{ Slow and fluttering, comparatively low.
<i>Kerivoula</i>		
<i>Vespertilio</i>		

[Almost certainly Mr. Shortridge means *Myotis*—R. C. W.]

Minopterus early High, very swift.

Emballonura early Erratic in flight. Like that of small *Pipistrellus* high (Java, N. Guinea, &c.)

Taphozous early Swift, high.

Rhinopoma early? Swift.

Nyctinomus early High, very swift (Java, Australia, etc.)

G. C. SHORTRIDGE.

August, 1912.

* Mr. Shortridge's notes were submitted to Mr. Wroughton who has added a few remarks in brackets under his initials R. C. W.—Eds.

No. VI.—THE HABITS OF VOLES.

Where voles of the genus *Microtus* are common in Kashmir and Himalayas, a curious phenomenon is revealed, on the melting of the snow, which covers their burrows in winter, in the long tortuous ridges of clay left lying on the surface of the ground. These ridges, often some yards in length, are *solid* throughout, more or less cylindrical, and from 2 to 3 inches in diameter in section. As often as not they are unconnected at their extremities with the entrance holes of the voles. The rough sketch below will perhaps explain my meaning better than the description, viz :—



A friend who had also noticed and taken an interest in these curious ridges informed me that he had once found them in the melting snow on a hillside, *running through the snow and not in contact with the ground though close above it*. This discovery shed some light on what was a perplexing puzzle, and led to the formation in my mind of the following vague theory of their origin, one which however does not altogether satisfy me.

If any of our readers can enlighten me with the true and scientific explanation I shall feel indebted to him or them.

I imagine then that, when their burrows are buried deep in snow, these voles abandon their usual habits of burrowing connecting passages underground (such passages being likely to collapse when the snow melts, and thus to lead to flooding of burrows), and construct instead passages *along the surface of the ground and through the snow*. But, in order that these passages may be kept dry and warm, earth is pushed up into the snow to form a roof above and possibly walls along the same, the earth for this purpose being excavated and brought from the holes, as *no trench is ever apparent under the ridges in question or connecting the holes*. When the snow melts on a slope these ridges can rarely, owing to force of gravity, be deposited on the ground vertically below the position they occupied in the snow, and must therefore often come to rest some little way down hill.

This explains their seeming lack of connection with the holes when found on dry ground. On deposition also the walls, if any, would tend to collapse and quickly assimilate with the surrounding soil.

Whatever the explanation of these mysterious ridges, however, they, at all events, bear silent witness to the activity of these little rodents when their homes are buried deep in winter snows and show that hibernation is not entirely spent in sleep.

KASHMIR, 1912.

H. A. F. MAGRATH, Lt.-Col.

NO. VII.—THE INDIAN BUFFALO (*BUBALUS BUBALIS*).

In the Bellary Gazetteer published in 1904, attention is drawn to the fact that "Many of the buffaloes in the district are peculiar in having a white patch between their horns." I have noticed that this is also of frequent occurrence in the North Kanara, Mysore and Dharwar districts, the white varying in size from a small patch, to the whole forehead; more rarely extending over the face. Another curious form not uncommonly observed is that in which the eyes are of a clear, almost China-blue instead of the usual dark brown.

In Blanford's "Fauna of British India" the only mention of any colour variety of the domesticated buffalo is "that the legs are occasionally white to the same height as in the Gaur," while the fact is noted that few of any animals have changed less in captivity than the Indian buffalo.

It would be interesting to know if this variety with the white forehead is peculiar to the south, or whether it is found throughout India.

Any one who has been in Java may have noticed the extremely large number of entirely albino buffaloes there, quite 20 per cent. of those on the island.

The Banting (*Bibos sondaicus*) is also very successfully domesticated in Java and Bali where it is indigenous.

G. C. SHORTRIDGE.

CAMP, BELLARY, August 1912.

[Both the variations mentioned by Mr Shortridge are to be seen amongst the dairy buffaloes in Bombay which come chiefly, we believe, from Gujarat, Kathiawar and the Punjab.—EDS]

NO. VIII.—TSINE (*BIBOS SONDAICUS*) CONSORTING WITH TAME CATTLE.

I was greatly interested in Mr. Hauxwell's note in the Journal published in July of a bull Tsine (*Bibos sondaicus*) consorting with tame cattle. To quote Mr. Hauxwell, "it is not an old bull, and it is strange why it should have taken to this solitary life. Can it be that it has been driven out or

the herd by an older and stronger bull, and so forced to come to the village cattle for companionship ? ”

I make no doubt that this is exactly what has occurred. I have known of three similar cases, two of Tsine consorting with tame cattle, and one of a Gaur which had attached itself to a herd of tame Mithan (*Bibos frontalis*). All three were young bulls—I have also heard of an old bull Tsine which was supposed to frequent cultivation in pursuit of tame cattle; but as my informant was a Burman it is possible that he may have been deceived by the size of animal into thinking it an old bull. An old bull Tsine shot by me was said to be this very beast, but I always had my doubts on the subject. His tracks were found some miles from the nearest cultivation and he was killed in dense Bamboo jungle. Still he may have consorted with tame cattle from time to time and the fact that he was well past his prime lends colour to the supposition. As all sportsmen know who have hunted Gaur and Tsine frequently, it is by no means an uncommon occurrence to come across quite young bulls leading a solitary existence, and the only explanation that presents itself is that they have been driven from the herd by the master bull. One would naturally expect, therefore, that when Tsine are found consorting with tame cattle they would be young bulls, or very occasionally old bulls past their prime. The sexual instinct would naturally be stronger in young bulls than in animals past their prime, and the former would also be less shy and wary than the old stagers. At the same time it is conceivable that in the case of very old bulls driven from the herd by stronger rivals, the sexual instinct would in some cases assert itself and the animal, debarred from consorting with its own kind, would occasionally take refuge in an artificial existence rather than become a recluse for good. Such cases, if they occur at all, must be of rare occurrence, and it would be interesting to have authenticated data on the subject. I do not know of any case of a bull in its prime—whether Gaur or Tsine—consorting with tame herds of Mithan or cattle, and it would seem to be extremely unlikely that any such could occur. My own theory is that when such animals take to a solitary existence they do so from choice, and merely for the time being. It was once my good fortune to shoot an erstwhile solitary bull Tsine while with a herd which he had joined on the day he was killed. This beast was a bull in his prime with a very fine head, showing no signs of advanced age. He had merely joined a herd when it suited him to do so. It may be asked why such an animal finding itself near a herd of village cattle should not join them as a younger beast occasionally does. The obvious reply is that the younger animal having been driven from a herd of his own kind is faced with two alternatives—either to remain solitary until old enough to take possession of a herd or to consort from time to time with tame cattle. The older beast on the other hand can appreciate a herd whenever inclined to do so ;

for even if driven from his own herd—an unlikely supposition—he is sufficiently powerful to find other herds in which he can hold undisputed away. But I would not be held to dogmatise on a subject of which we know very little. I state my theory for what it may be worth, in the hope that some observer with more knowledge of the subject than I can lay claim to will be able to throw more light on this very interesting question. While no one can account for the vagaries of individuals even in the animal world, it will, I think, be admitted as a general rule that for wild animals to consort with tame is an unnatural state forced on them by circumstances beyond their control, and that no animal having access to its kind is at all likely to seek an artificial existence even for a short period.

MALAKAND, 20th August 1912.

G. P. EVANS, MAJOR,
XIX Punjabis.

NO. IX.—HABITS OF THE KASHMIR STAG (*CERVUS*
KASHMIRIENSIS) IN SUMMER.

The comparatively high altitudes to which the Kashmir Stag ascends in summer has probably attracted little attention, interest in this animal being, as a rule, confined to the shooting season when it descends, and keeps mainly to the forest levels. This year I frequently saw 'Barasing' (so called) and their numerous tracks on a hill top, 14,000', and on one occasion observed a herd of about 16 hinds at 14,000' and still climbing by a track which would take them to the water shed 15,000' and over, and for which I have little doubt they were making. These high ascents, far above forest levels, are made in the mornings, and are generally for the purpose, besides grazing, of indulging in a midday siesta at some elevated spot where fancied security from enemies may be obtained.

The unwariness of a big stag met with one day afforded me what must be a rare, if not unique, experience. On a hillside at 13,500' the sudden appearance of what, at first sight, looked like a great caribou head, over a snow field above me caused me considerable astonishment. But realizing that caribous do not exist in the Himalayas, and that it was a big stag in velvet, I had to deal with, I stood and watched, and saw the 'head' slowly sink behind the snow again. Feeling sure that the owner thereof had settled down to rest I decided to stalk him. The only route lay to windward and a fresh breeze was blowing across the hill. Notwithstanding I managed to reach unobserved and unwinded a small mound behind which I suspected he was lying. Creeping up and peeping cautiously over, there, sure enough, lay the great beast—a true 'monarch of the glen' fast asleep and only 16 yards (paced) away. Luckily my terrier, who was

behind me, did not scent or spot the sleeping animal, and I was able to survey him at leisure. Though he lay with head towards me and I was quite conspicuous, taking little trouble to conceal myself, he never winked an eye, only his ears flapped lazily keeping off the flies. The head was a fine one (12 pointer) but thick in velvet. The coat was patchy and evidently in process of being shed. I gazed my fill, then dropping quietly behind cover again, left him to his siesta and passed on up the hill. As luck would have it my camera was not with me that day and I have since often regretted the unique snapshot lost. From a coign of vantage, some 800 yards beyond and above, not a movement of the stag could escape me so I sat and munched my sandwiches and enjoyed the panorama of snowy peaks and glaciers spread before me.

For 2 hours or more he slept peacefully. Then, rising, shook himself, sauntered across the snow, and proceeded to drink at a puddle left by the melting snow, after which he began to drop slowly down hill, on the steep side, browsing the while. Wishing to have a last look at him on my way down I made for the spot where he had disappeared from view and peered over.

There he still stood, some 80 yards below, browsing quietly. I let him see me but he evinced little sign of fear, merely dropping a few feet lower, and resuming his browsing. But for my terrier which, this time, spotted him and gave him chase, I could have approached him much closer. Seeing the terrier he rattled down hill and out of view, leaving a void in the picturesque landscape.

When descending a hill these stags look awkward and clumsy compared with the graceful bounding movements of Markhor or Ibex.

Some days later a further curious experience with Kashmir Stag befell me on this same hill. Climbing it with a brother officer we had a cooly with us carrying our paraphernalia. When some way up I asked the latter if he had ever been on this hill before and if he knew that "Barasing" lived on top. He replied that he had not, and expressed a desire to see a "Hangul." This I undertook to promise to show him. Within 5 minutes of this conversation, appearing slowly over a ridge to our left, we saw the antlers of a big Barasing, then the whole animal standing on the sky line. Following him came another, then another, and still others, until there were *five* grand stags, all apparently good shootable heads, standing in full view and barely 400 yards away! No one was more astonished than I, for although feeling pretty confident of meeting with a stag that day, I was not prepared for the splendid fulfilment of my promise in the vision we had just seen. For some days after this I believe I bore the reputation of being a "Jadu-gar."

H. A. F. MAGRATH, Lt.-Col.

KASHMIR, August 1912.

NO. X.—ABNORMAL TYPE (?) OF EGGS OF THE LITTLE
FORKTAIL (*MICROCICHLA SCOULERI*, Vigors).

On the 12th May last, I found a nest of this species placed in the niche of a rock by the side of a large waterfall in the neighbourhood of Simla. The position of the nest was betrayed by one of the birds, which hurriedly left the spot on my approach. On examining the nest I found that it was practically completed, and was ready for the birds to lay in. Allowing a few days to elapse I sent one of my hunters to bring away the eggs, if any, and also the nest. He carried out my instructions, but, on examining the eggs, which were quite fresh and three in number, I was much astonished to find that they were *pure spotless white*. I immediately questioned my man as to the identity of the bird, which he knows *well*. He firmly maintained that the eggs in question belonged to this Forktail, that he had distinctly seen it leave the nest on his approach, and that when he removed the eggs they were quite warm. I have no reason whatever to doubt the man's statements, for I have always found him truthful, and in this instance there was no particular reason for him to deceive me; but nevertheless I still feel rather disturbed about the colouration of these eggs. Had I for a moment foreseen this contingency, I should of course have spared no pains to put the identity of the bird beyond doubt. As things stand now, *there is doubt* but doubt which can be dispelled by the experiences of other Ornithologists.

I should like to know whether this Forktail, like some other birds, for example, *Dicrurus ater*, lays eggs of two different types: one, pale dingy pink, spotted and speckled with reddish brown, and the other pure spotless white?

The eggs from this nest are, as already stated, pure spotless white, and they have a distinct gloss. In shape they are somewhat elongated ovals, slightly pointed towards the small end. Their measurements compare as follows with those of the normal type:—

<i>Abnormal type (?) of eggs.</i>	<i>Normal type of eggs.</i>
(1) $\cdot 81'' \times \cdot 58''$	Average measurements of 11 eggs $= \cdot 79'' \times \cdot 57''$
(2) $\cdot 82'' \times \cdot 58''$	
(3) $\cdot 85'' \times \cdot 6''$	

I may add that there is no doubt whatever about the nest. It was of the usual Forktail type—a small cup, composed externally of moss, and lined with a little dry grass, and a few dead and skeleton leaves.

Since the publication of my notes about this species at pages 257—261 of Vol. XXI of the Journal, I have found the following nests in addition to the one mentioned above:—

- (i) *Keonthal State*, 1st May: elevation 5,000 feet; nest with three young, just hatched.

- (ii) *Keonthal State*, 21st May; elevation 5,000 feet; 3 hard set eggs (normal type).
 (iii) *Ditto.* 21st May; elevation 5,000 feet; two young, full fledged.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 29th August 1912.

NO. XI.—NESTING OF THE WESTERN BLUE ROCK THRUSH
 (*PETROPHILA CYANUS*, Linn) IN THE NEIGHBOURHOOD
 OF SIMLA, N.-W. HIMALAYAS.

After several years of fruitless search, I have at last succeeded in finding the nests of this species, which is a tolerably common summer visitant to these N.-W. Himalayan ranges, arriving in April, and leaving about the beginning or middle of September.

In the neighbourhood of Simla, it breeds at elevations of 6,000-7,200 feet, on bare rocky hills, during May and June. The nests are shallow saucers, in some cases mere pads, adapted to the shape of the cavities in which they are placed, and are composed externally of dry grass, lined with rootlets. The diameter of the egg-cavity does not exceed 4", and its depth is about 1½". The external diameter varies from 5 to 6", and the height is about 2½ or 3". The nests are placed sometimes in low stone walls occasionally under boulders, but more frequently in fissures or crevices of large rocks.

The number of eggs is usually four, and their colouration is exactly as described by Dresser in his "Manual of Palearctic Birds", page 23. The "speckled" eggs seem to be the commoner type.

The average of 12 specimens measured was 1.01" × .75".

Between the dates 18th May and 20th June, I found, in addition to the eggs mentioned above, no less than eight nests containing young ones. Five of these nests had three young each, and two, four young each: the exact number of young in the eighth nest could not be satisfactorily ascertained, as the latter was placed very far back in the fissure of a large rock.

The nests of this Thrush, especially when they contain eggs, are most difficult to find, as the old birds are very cautious and wary in their movements, and it is only by patient and laborious watching that one can hope to be successful with them. The cock bird, though he helps in feeding the young, and is always much in evidence when the eggs are hatched, keeps far away from the scene when building operations are in progress. The hen alone carries the materials, and if she catches sight of one, or suspects that she is being observed, will sit on a rock, with the grass in her mouth, for whole hours at a time, rather than give away the show.

When there are eggs in the nest the hen bird sits very close, and on two occasions I have caught her on the nest. So far as my experiences go, I do not think that the cock takes any part in the hatching of the eggs.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 29th August 1912.

NO. XII.—THE HIMALAYAN GREENFINCH
(*HYPACANTHIS SPINOIDES*).

In Mr. P. T. L. Dodsworth's interesting note on *Hypacanthis spinoides* (The Himalayan Greenfinch) in Vol. XXI, No. 3, p. 1076 of this Journal, he gives the distribution of this species as follows :—"Along the Himalayas at elevations 6,000—10,000 and perhaps even higher from the south side of the Pir Panjal Pass in Kashmir (Brooks) to Sikkim (Blanford) also recorded from Manipur (Godwin Austen). During the cold weather these birds move to tower elevation, and the N.-W. Himalayan ones at all events are found in the Duns and plains (Bijmor to Pilibhit) at the foot of the mountains (Osmaston). In quoting this as the distribution Mr. Dodsworth has apparently overlooked various publications in this Journal from the pens of Colonel Rattray, Captain C. H. T. Whitehead and others which add considerably to our knowledge in this respect and shew that the range of The Himalayan Greenfinch extends very much further to the North-West. For example it is common in the Murree Hills and Hazara. It occurs in the N.-W. F. P. (Samina), and not improbably breeds in the Kurram Valley. I may add also that in parts of the Peshawar Valley it is a common winter migrant, being freely snared there for the Peshawar bazaars, where it is a favourite cage bird with the Pathans. With regard to Kashmir its range extends well north of the Pir Panjal and the Vale of Kashmir itself, in the Liddar and Sind Valleys, it breeds commonly from 7,000 to 9,000 ft.

H. A. F. MAGRATH, Lt.-Col.

KASHMIR, August 1912.

NO. XIII.—EARLY ARRIVAL OF GREY WAGTAIL.

I am sending you a specimen of what I think is the Grey Wagtail (*Motacilla melanope*) shot near here on the 22nd August, by a stream in the midst of dense jungle. Chikalda is 125 miles south of Sehere as the crow flies; but Capt. Whitehead, in his article which appeared on page 153 of Vol. XXI of the Journal, notes its earliest appearance at that place as the 20th September. Considering how late the rains broke here, not until the 10th July, and that it breeds in Kashmir above 6,000 ft. and in Afghanistan in May and June (dates on p. 294 of Vol. II, F. B. I.) This must be distinctly an early bird.

Will you kindly verify my identification of the specimen which is unfortunately in a somewhat shattered condition ?

J. DONALD, I.F.S.

CHIKALDA, BERAR, 22nd August 1912.

[The bird is as Mr. Donald suggested a Grey Wagtail *M. melanope*.—EDS.]

No. XIV.—EGGS OF THE LARGE HAWK-CUCKOO (*HIEROCOCCYX SPARVERIOIDES*).

In his "Indian Parasitic Cuckoos" Mr. E. C. Stuart Baker reproduces an article of his printed in the Journal of the Bombay Natural History Society in 1906. The article shows that at the time of writing, the oology of this cuckoo was not so thoroughly known as not to require further investigation. Colonel Rattray was then the only person who had obtained undoubted eggs of the bird, and though these were blue Mr. Stuart Baker hinted at the possibility of there being also a chocolate coloured variety.

For many years my brother Mr. B. B. Osmaston has tried to obtain eggs of this cuckoo from the Himalayan region round about Naini Tal where at suitable elevations it is no uncommon bird. During the rains of 1911, he found a nest of the Red-headed Laughing-Thrush (*Trochalopteryx erythrocephalus*) close to Naini Tal and it contained two Laughing-Thrush's eggs. Intending to rear the young birds he sent his chaprassy a few weeks later to fetch them. The chaprassy returned with a young cuckoo, the sole occupant of the nest, and the cuckoo proved to be a young one of *H. sparverioides*.

We now knew that this cuckoo laid her eggs in the nest of this bird, and we decided to thoroughly search the same place again this year for eggs. The hill overlooking Naini Tal rises to a height of 8,600 feet, and for the last 1,000 feet the vegetation is chiefly "Karshu" oak mixed with shrubs of various species. There are scarcely any birds breeding here during the rains excepting the Red-headed Laughing-Thrush (*Trochalopteryx erythrocephalus*) and Himalayan Streaked Laughing-Thrush (*Trochalopteryx lineatus*) and of these the former is by far the commoner. In the beginning of June my brother visited the place and found the Large Hawk-Cuckoo calling incessantly and in considerable numbers, but the Redheaded Laughing-Thrushes had hardly commenced nesting. At the beginning of July the cuckoos were still continually to be heard and the Laughing-Thrushes were nesting in earnest.

On 7th July I found a nest of *T. erythrocephalus* containing two fresh Laughing-Thrush's eggs and one fresh cuckoo's egg. The nest was about six feet from the ground in a dense holly bush. When I took the eggs a cuckoo (*H. sparverioides*) was calling lustily only fifty yards away.

On 18th July I found another nest of *T. erythrocephalus* containing one

fresh cuckoo's egg. The nest was placed about 8 feet from the ground in a small Deodar. There is some mystery about this nest as it contained no Laughing-Thrush's eggs nor were the parents lurking round as they usually do. In fact there had evidently been some tragedy recently enacted for the nest contained besides the cuckoo's egg, a small piece of fresh meat with a little skin and a few bedraggled feathers adhering to it. The nest, however, was not disturbed. When I found the nest a cuckoo was calling persistently only 100 yards away.

On 28th July I found another nest of the same Laughing-Thrush about eight feet from the ground in a young oak tree. It contained one Laughing-Thrush's and one cuckoo's eggs, both quite fresh. This time I did not hear the cuckoo calling as on previous occasions.

These three nests containing cuckoo's eggs were all found within a quarter of a mile of one another, and on the many occasions on which I hunted the locality I never failed to hear the cuckoo calling close round, yet never heard the call of any other cuckoo. The elevation was about 8,200 ft. Though there is no absolute proof of their identity there is little room for doubt, considering also that they agree with the authenticated eggs obtained by Colonel Ratray.

All three eggs are of the same colour and texture. They are pale greenish-blue (almost exactly the same blue as the ground colour of the Laughing-Thrush's eggs) and distinctly glossy. They are also traced by distant corrugations and minute raised dots. Their shape is a narrow oval compressed at the smaller end in two of the specimens, but not in the third. The dimensions of the eggs are as follows:—

Egg taken on 7th July 1912	..	..	1.18" × .81"
„ „ 18th July 1912	..	..	1.10" × .81"
„ „ 28th July 1912	..	..	1.11" × .84"

The eggs of the Laughing-Thrush are ordinarily spotted round the larger end though occasionally unspotted eggs occur, but even in these rare cases the cuckoo's eggs may be at once recognised by their glossiness, those of the Laughing-Thrush being entirely without gloss.

NAINI TAL, 21st August 1912.

A. E. OSMASTON.

NO. XV.—QUESTION WHETHER *GYPs FULVUS*, Gmelin,
THE GRIFFON, OCCURS IN THE HIMALAYAN
DISTRICTS OF THE PUNJAB.

Assuming that the *Gyps fulvescens* of Hume is identical with the *Gyps fulvus* of Gmelin, the common Griffon of Europe, I should feel much obliged if some Ornithologist would kindly let me know whether he has observed this bird in the *Himalayan* districts of the Punjab, and, if so, at what places?

Strachey records * it from Kumaon, and Blanford gives (Fauna, B. I. (Aves), iii, p. 320) its range in the *Himalayas* as extending east as far as Nepal and Sikkim, but I have been unable to trace all the data on which the latter statement was founded.

The common species in the neighbourhood of Simla is the Himalayan Griffon, *Gyps himalayensis*, Hume. And this is the Vulture, not *Gyps fulvus* that Colonel C. H. T. Marshall mentions (Ibis, October 1884, p. 405) in his list of Chamba birds.

Hume spoke (Rough Notes, p. 21) of the Griffon—his *Gyps fulvescens*—as the “Vulture of the desert,” and it seems only reasonable to conclude that if it had occurred in the N. W. Himalayas, he would surely have mentioned the fact.

I see that Colonel Ward includes (J. B. N. H. S. Vol. XVII, p. 728) *Gyps fulvus* in his birds of Kashmir, where, he says, it is resident in many districts, but on the other hand it is significant that Davidson never saw it there (Ibis, January 1898), and all the Vultures procured by Dr. Abbott (Proc. U. S. N. M. Vol. XVIII, p. 453, and Vol. XXII, p. 210) in that country turned out to be Himalayan Griffons—a totally different species.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 27th May 1912.

[In 1869 Hume described *Gyps fulvescens* and on account of the knowledge of its distribution then wrote of it “as the Vulture of the desert.” Since, however, this vulture has been recorded from Nepal and still later under the name of *Gyps fulvus* by Colonel Rattray from Thull and Captain Whitehead from the Kurram Valley. Though Dr. Blandford treated *fulvescens* as a synonym of *fulvus*, Dr. Sharpe both in his catalogue and hand list considered them distinct giving the distribution of *fulvus* as “S. and C. Europe, N. Africa and Sudan,” and that of *fulvescens* as “Afghanistan, N. India”—Eds.]

No. XVI.—A KITE'S LARDER.

With reference to Mr. Remington's enquiry in the last issue of the Journal, I do not think it is usual for this species (*Milvus govinde*) to make “larders.” During a course of observations extending over several years, I have only once come across a “larder.” It was in Calcutta where, on a certain tree, a pair of these Kites have bred for several years in succession. From my Office window the nest was not distant more than 10 feet, and I had ample opportunities of closely observing the owners. I noticed that the Kites frequently brought dead rats, bones, pieces of meat, and ate them on the edge of the nest, leaving the scraps behind to

* Is it possible he confused this bird with *Gyps himalayensis*, Hume?

be devoured at leisure. Both the old birds resorted to this "larder" at frequent intervals during the course of the day, and for many months after the young had left the nest.

In connection with the breeding of this species, I may mention that I have frequently found lumps of clay and small stones in their nests when the latter contained eggs (see also Jesse in "Ibis," January 1903, p. 75), but have never yet been able to make out what purpose this rubbish serves. I daresay other Ornithologists have had similar experiences, and it would be interesting to know what explanations, if any, have been advanced in regard to this curious practice indulged in by these Kites.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 29th August 1912.

No. XVII.—TAMENESS OF GREAT INDIAN BUSTARD
(*EUPODOTIS EDWARDSI*).

With regard to the recent articles on Bustard in your Journal, readers may be interested in hearing that, in spite of the extreme wariness of the Great Bustard, on the 15th of May this year, I came upon a pair of these birds wading at the edge of a large pond and drinking. The pond itself is about half a mile from a town of considerable size and there were at the time a group of dhobies washing clothes on the opposite side of the pond within 200 yards of the Great Bustard. I myself walked to a point just opposite them, and about 90 yards distant from them, so there can be no mistake about their identity. I enquired whether any had been seen before in the locality and was informed that they had not. It would also appear that these particular birds were in the practice of coming here to drink, for a friend of mine who happened to visit the pond some three days later also says he saw them. I do not suppose for a moment that it is an unknown characteristic of the Great Bustard that he should come to drink at ponds, but I am surprised that such a retiring bird as he should come to drink at a popular dhobies' ghat.

R. TEAGUE JONES,

Indian Police.

FEROZEPORE, PUNJAB, 4th August 1912.

No. XVIII.—BUSTARD IN KATHIAWAR.

In ordinary years during my district touring in Sorath Prant I have occasionally come across a solitary Great Indian Bustard (*Eupodotis edwardsi*) sometimes two or three together, but they are by no means

common. This year owing to the failure of rain in other places I suppose these birds have been seen in large numbers throughout the Prant. In all I have seen over fifty close to my headquarters alone. In one morning I came across two distinct groups of 9 and 10 together. At the time of the bajri harvest they could be easily bagged with a shot gun, being feeding so busily as to be quite off their guard, and I once got two fine cock birds 18 and 20 lbs. in weight, left and right. After the crops were cut they could only be bagged with a rifle. One male bird of 16 lbs., I had shot with a .310 rifle and on picking him up by the legs to feel his weight a long red thing dropped from his mouth. On examining it closely I found it to be the partially digested body of a snake about 2 ft. long. In the stomach of the same bird I found another snake, "a phoorsa," evidently recently swallowed, and two stones measuring $1\frac{1}{4}$ inches by 1 inch. I have got the snakes and stones in spirits and will send them to you on the first opportunity. As the hot weather advanced the Bustard disappeared and I have not seen one since early in April.

J. R. CARTER, MAJOR,
Bombay Political Department.

CAMP VERAVAL, 7th June 1912.

No. XIX.—THE GREAT INDIAN BUSTARD (*EUPODOTIS EDWARDSI*).

During a shoot in February 1906 in the Bikaner State near Bhatinda, with a party of four guns, Mr. R. Sale Bruise, Punjab Police of Karnal, shot a male bustard. The neck of the bird was pure white, its length from tip of wing to tip of wing was exactly 98 inches and the weight 24lbs. The food bag contained, whole ears of barley; some (blister?) beetles, and a snake about 9 inches long.

Two females were also shot close by, but they weighed only 8 and 9 lbs. They had also been feeding on barley and beetles, but had been unfortunate in their hunt for reptiles.

A. B. AITKEN.

QUETTA, 20th August 1912.

[We are glad to welcome this note from Mr. A. B. Aitken, the son of the late Mr. E. H. Aitken, one of the founders of this Society.—EDS.]

No. XX.—THE MASKED BOOBY (*SULA CYANOPS*)
IN BOMBAY HARBOUR.

Through the kindness of Mr. E. R. H. Jackson of the Bombay Port Trust, the Society has received a fine specimen of the Masked Booby, which was captured in an exhausted condition on a dredger near the new

dock works. In 1909 a similar specimen, also captured in the harbour was presented by Mr. Jackson and there is another specimen in the Society's collection labelled "Bombay Coast, 25-7-02". Mr. W. F. Sinclair writing of this bird in an early number of the Society's Journal says that "It is not uncommon for these birds to be brought up here (Alibag) by south-westerly gales and be caught by hand."

According to the catalogue of birds in the British Museum this bird is found in the tropical seas throughout the world, but when the catalogue was published there were in the collection only two skins from north of the equator, one from Tenasserim and the other from the Mekran Coast. In the Handlist of birds, however, the distribution is given as "S. Tropical Seas."

N. B. KINNEAR.

BOMBAY, *August* 1912.

No. XXI.—BAIKAL OR CLUCKING TEAL (*NETTIUM FORMOSUM*).

The S. S. "Empire" of the Eastern & Australian Line on her homeward voyage from Japan to Australia in January 1912 had on board a consignment of about 300 Baikal or Clucking Teal in cages. The cages were kept on the bridge deck out of the way of the passengers, where they could not be seen. The passengers in the smoking saloon of the upper deck were always aware of the continual clucking noise that the teal made. The noise was very similar to that made by a clucking hen. In fact all the passengers were under the impression that the Captain, for some reason known only to himself, had a large stock of clucking hens on the bridge deck. One passenger, who was told that the noise proceeded from ducks, would not believe till he saw and heard with his own eyes and ears. The purser was unable to give any information beyond the fact, that the teal had been shipped in Shanghai and were consigned to Port Darwin, and that a similar consignment was carried on every voyage.

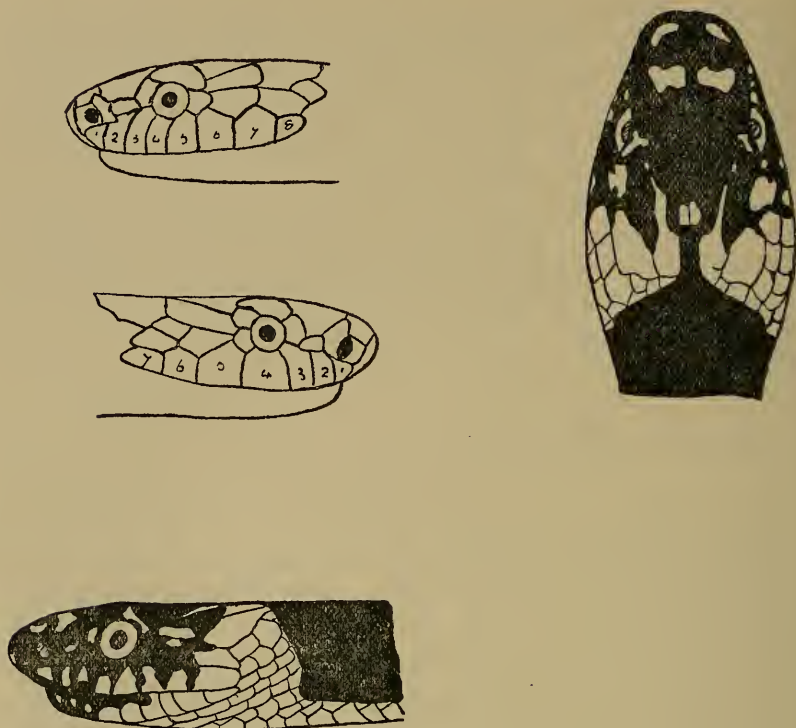
A. B. AITKEN.

QUETTA, *20th August* 1912.

No. XXII.—IS *LYCODON GAMMIEI* (Blandford) AN ABERRANT SPECIMEN OF *LYCODON FASCIATUS* (Anderson)?

In Vol. XXI of the Journal (Part I, page 279) Major Wall compared my specimen of *L. fasciatus* obtained in the Eastern Himalayas with the type of *L. gammiei* which is in the Indian Museum.

Regarding the point of the loreal shield, I must admit that it is pointed, to some extent, posteriorly and not anteriorly as stated, the third labial and the præocular intervening between it and the eye.



I figure the exact condition of this shield and also a drawing of the markings on the head. The dark portions are deep black and the rest yellowish green. The illustration is about twice the natural size.

NAGPUR, C. P., 13th August 1912.

E. A. D'ABREU, F.Z.S.

NO. XXIII.—NOTES ON THE SIZE AND BREEDING
OF THE COMMON GREEN WHIPSNAKE
(*DRYOPHIS MYCTERIZANS*).

Two common green whipsnakes were recently purchased from a snake-charmer, who said they came from Thana and Bandup (Salsette) respectively. Both were large specimens, the Thana one measuring 6'-4½", while the other was 5'-10".

On 14th August the larger of the two specimens died in our museum and on being dissected was found to contain fifteen young ready for expulsion. Two days later the remaining specimen gave birth to eighteen young, one of which was born dead, having been unable to clear itself of the egg envelope. The remaining young sloughed on the second day after birth. They measured 13 inches.

BOMBAY, September 1912.

N. B. KINNEAR.

No. XXIV.—COBRA BREEDING AT PAREL.

During the past ten years many of the cobras (*Naia tripudians*) sent to the Bombay Bacteriological Laboratory have laid eggs while in captivity, but hitherto all attempts at hatching out young cobras have proved failures. Whether left with the mother, or kept apart from her, the eggs have always shrivelled up and no development of embryos took place. When kept in an incubator at blood-heat, the eggs became rotten in a few days, and when buried in dry sand they shrivelled up.

In 1905 a full grown krait (*Bungarus cæruleus*) and some half dozen eggs were dug up close to the Laboratory. Some of these eggs were kept in a box with the mother, and some were buried in the soil in which they were found. Both sets of eggs remained infertile.

In 1909, Major Liston, I.M.S., suggested that the cobra mother and her eggs should be placed in a glass case half full of sand, that the case should be darkened by winding cloth round it, and that the sand, and the cloth cover of the case be kept moist. Next day one egg was examined and a trace of embryo found. Unfortunately the mother died 9 days afterwards, and the eggs shrivelled up.

This year (1910) we had occasion to require a considerable number of cobras for experimental purposes, and four out of 21 laid eggs, and gave us the chance of experimenting further. Two of these cobras laid 21 and 22 eggs respectively, the other clutches were not counted as the eggs were glued together and mixed up with shreds of the mother's cuticle, and it was thought advisable to leave them alone. These latter batches all proved failures as far as hatching out young ones was concerned.

With regard to the period of the year when young cobras may be looked for, our experience is that the month of May is the usual time. Thus from 1st January to 31st May 1910 we received 24 cobras, of which 4 laid eggs; while after the 31st May 25 more cobras were received and none laid eggs.

The following table shows the date of receipt of cobras, and the laying of eggs :—

Number.	Date of receipt of cobras.	Date on which cobra laid eggs.	Place from which received.
28	11-1-10	12-5-10	Khandwa.
30	11-1-10	14-5-10	"
39	20-4-10	11-5-10	"
42	30-4-10	9-5-10	"

The following is an account of the plan we employed with success in the case of the eggs of cobra No. 28 :—

The eggs were laid in the tin biscuit box in which the cobra was kept on 12th May 1910. The eggs, 21 in number, were placed on the surface

of moist earth which four-fifths filled an ordinary garden flower pot. The eggs were then carefully covered with dry sifted earth to a depth of one inch, and the earth also slightly moistened. The pot was kept in a cool dark room. Next day we carefully removed the covering earth and found to our joy that the eggs were plump and fresh, looking though, of course, stained by the damp covering. The earth was replaced, and carefully sprinkled with water by old Benjamin, the snake man, who took quite a naturalist's interest in the proceedings. We had no idea of the incubation period of snakes' eggs, so sent Benjamin to enquire of some Bombay snake-charmers. He brought back news that 21 days was the recognised time. So on the 2nd of June, 22 days afterwards, we dug out one egg and opened it to see what progress had been made. The egg was quite plump and fresh looking, and contained a quantity of clear albumen, with a well formed embryo in one end of the shell. The small embryo snake was coiled up beside the yellow yolk, and with a small cord connecting it to a placenta attached to the shell. The embryo was white in colour, almost four inches long, and the heart could be seen distinctly pulsating. No scales could be made out on the skin, but the head, was large with two prominent eyes.

On the 23rd of June, *i.e.*, on the 43rd day, we opened another egg, and found another living embryo in a further stage of development. It was some seven inches long, with well developed scales on the skin, and the heart could be seen beating vigorously.

The pot was watered daily as before, and was covered with wire netting as a precaution against the escape of the young should they happen to hatch out during the night. At length on the 18th of July, 67th day, a cobra head was noticed protruding, as far as the neck, from the egg shell. This specimen was removed from the flower pot and carefully washed in a basin. On enlarging the opening a little the embryo emerged with the placenta still attached.

On the following day others were found in a similar condition. They were left alone all night to see if they had strength to deliver themselves. Two had succeeded in this endeavour, but one of them being dead, it was thought advisable to render artificial aid to the others, and several of the little cobras lived for several weeks after. It was noted as a curious fact that all the young cobras had well developed spectacle marks on their hoods, although the mother was a black "*cæca*" from the Central Provinces, with no trace of a spectacle mark on the hood!

The new born cobras had a cutting chisel on the snout of the same shape and appearance as that described by Major Wall in the Society's Journal, Vol. XXI, page 693. Major Wall saw the specimens, but unfortunately the notes on the subject which he kindly jotted down have been mislaid owing to the transfer of one of us (Col. W. B. Bannerman, I.M.S.) to Madras.

In all, 21 eggs were placed in the flower pot. Two were opened to see what progress the embryos had made; four were found shrivelled (on 4th June) and proved on dissection to be infertilised and quite solid. Of the 15 remaining eggs, 14 hatched out at full time, and one was dead in the egg but appeared fully developed.

W. B. BANNERMAN, I.M.S.,
Surgeon-General.

J. P. POCHA, L.M. & S.,
Senior Assistant Surgeon.

BOMBAY BACTERIOLOGICAL LABORATORY,
PAREL, 15th July 1912.

No. XXV.—BREEDING OF THE COMMON GREEN VIPER
(*LACHESIS GRAMINEUS*).

On 30th June a female Common Green Viper which was said to have come from Khandalla gave birth to fifteen young in our Museum. They sloughed first on 24th July. The brood vary considerably in colour, some being much darker than others and nearly all show the blackish markings on the back, though in the light coloured ones it is very faint. The mother belongs to the variety which has a yellow line along the side of the body, but in the young this line is hardly discernable. It has been found impossible to get the young snakes to feed naturally, though they have been tried with earth worms, young frogs, grasshoppers, young cockroaches and other insects. They have however been fed twice with raw meat and the nine which are still alive look well and are beginning to grow.

N. B. KINNEAR.

BOMBAY, September 1912.

No. XXVI.—SAW-SCALED VIPER (*ECHIS CARINATA*)
AS A TREE SNAKE.

Some time ago a note appeared in the Journal stating that the phoorsa very rarely climbs trees. At the time I doubted the correctness of this as regards the habits of this snake in North Gujarat, as ten years ago I frequently found a snake, which I believed to be of this species, on cactus hedges and in bushes and small trees a few feet from the ground. I presumed however that I might possibly have been mistaken in my identification of the species, though I did not think it likely. I have now returned to the same part of the country and find that my original belief was correct. In confirmation I am sending you a specimen of *Echis carinata* which I found this week and killed in the outer branches of a

lime tree at a height of 4 feet from the ground. *Echis* is not a difficult snake to recognise if one knows its "points" but perhaps you will kindly confirm my identification.

A. H. E. MOSSE, CAPT., I. A.

PALANPUR, N. GUJARAT, 23rd July 1912.

[The specimen sent by Captain Mosse is certainly *Echis carinata*.—EDS.]

No. XXVII.—HABITAT OF *ECHIS CARINATA*.

It is generally supposed that the saw-scaled Viper (*Echis carinata*) is rarely seen at a height of 5,000 feet. Major Wall in his book "The Poisonous Terrestrial Snakes of our British Indian Dominions" writes of the *Echis*: "It is an inhabitant of the plains and becomes progressively scarcer at altitudes ranging up to 5,000 feet. 5,700 feet is the highest I know of."

It is of interest therefore to note that at Kacha Thana, a small outpost in the hills of the Chagai Tahsil of Baluchistan, at an altitude of 5,000 feet, the *Echis* is quite common. During the past three months I have obtained six specimens, all from the Kacha nullah, at heights ranging from 5,000 to 5,400 feet.

Unlike the Persian Horned Viper, another common snake in this locality, the *Echis* is apparently not timid in approaching human habitations. About a fortnight ago while the Officers of the Garrison were sitting in front of the Mess Bungalow before dinner, an *Echis* was observed quietly making its way under the chairs. It passed beneath the whole line of deck chairs and was unconcernedly heading for the verandah when I captured it.

Local Balochis call the *Echis* "landi mar" evidently in allusion to the brevity of its caudal appendage. It is also occasionally named "gwanden mar" or "little snake" in contradistinction to the "shakhwala mar" (*Pseudocerastes persicus*), an altogether bigger and stouter snake and the only other poisonous species common in this part of Baluchistan.

G. G. JOLLY, CAPT., I.M.S.

KACHA THANA, 2nd September 1912.

No. XXVIII.—"POISONOUS" LIZARDS IN INDIA.

With regard to "poisonous" lizards you may be interested to have one little piece of negative evidence. Last Saturday (17th) being Nag Panchami up here, some of the servants went round showing a number of snakes and a "gubera" (young *Varanus*). We were assured that this was deadly poisonous, but after it had been on show for about three hours—with a string tied round its middle—it apparently got annoyed and turned round and bit the man in his finger. The unfortunate man sucked

the wound and looked rather frightened and then went on showing his snakes ; he is still alive and doing his regular work.

H. F. SAUNDERS.

THE FORT, GWALIOR, C. I., 26th August 1912.

[This subject was thrashed out in the early numbers of our Journal, Vols. III and IV (1888-9), but the belief is still apparently as strong as ever in Gujerat, Sind, Rajputana, Central India and Baluchistan that the young of the *Varanidæ*—otherwise known as Monitors or “Ghorpads,” “gho-samps,” also “Bis-cobras”—are poisonous.

It is difficult to trace whence this opinion has arisen. In Kaira, Gujerat, it is known as “Chandan-goli” and is “said to be as deadly as a cobra and able to spring ten paces” (A. Wood, I.C.S.).

Other lizards in India also bear an equally evil reputation, particularly *Eublepharis hardwickii* and *E. macularius*, but so far as can be ascertained no lizard in India is poisonous.

According to Mr. E. E. Green “the Brahminy Lizard,” the common skink, *Mabuia carinata*, holds a similar reputation in Ceylon. He mentions a case in which a lady was bitten by one of these lizards. The injured finger in a few hours’ time became swollen and tender but by next day practically all the swelling and tenderness had disappeared.—EDS.]

NO. XXIX.—THE FOOD OF A BULL-FROG (*RANA TIGRINA*).

In Vol. XXI, No. 2 of our Journal, Mr. S. P. Agharkar states a few things about the diet of a bull-frog (*Rana tigrina*) and remarks at the end of his note that “further observations on this point by our members would yield interesting results.” Taking advantage of this remark I put down a few observations on the subject.

On the 5th of September 1910 I dissected a freshly caught frog (*Rana tigrina*) before my B.A. students. On opening the animal, the very first thing, which struck me, was the unusual size of the stomach. I made an incision on the wall of the stomach and on carefully examining the contents I found to my surprise a big mole-cricket (*Gryllotalpides*), twenty maggots of a fly, a big beetle (*Scarabæidæ*), a small shell of a snail and some green vegetable product.

On another occasion, I had put a frog in the cage of a John’s earth snake (*Eryx johni*) to serve the latter as its food. In the cage as much of the sand was spread as would be sufficient for the snake to hide itself. After 3 days when I saw that the snake would not go for the frog, I took out the latter and dissected it. On dissection it was found out that the stomach was tensely filled with sand. I cannot say definitely whether the frog had swallowed sand to get some nourishment from the small insects in the sand or for some other purpose.

BIOLOGICAL LABORATORY,

J. P. MULLAN, M.A.

ST. XAVIER’S COLLEGE, BOMBAY, 16th August 1912.

No. XXX.—VITALITY OF A BUTTERFLY.

While watching a cluster of about thirty *Papilio philoxenus* which were feeding on the flowers of a creeper, I noticed one of these butterflies had a large heavy pin driven through the thorax. It must at some time have been caught and pinned down, afterwards escaping. It was in very good condition and the pin did not seem to interfere in any way with its powers either of feeding or of flight, for when I tried to capture it by taking hold of the pin, it darted away and showed itself as strong on the wing as any other of its kind.

G. A. HASSELS-YATES, CAPT., R. G. A.

KHYRA GALL, MURREE HILLS, 11th July 1912.

No. XXXI.—THE BED BUG (*CIMEX ROTANDATUS*) ON THE
COMMON YELLOW BAT (*SCOTOPHILUS KUHLI*).

Now that the responsibility of the Bed bug for "Kala azar" has been established, an observation I made in 1907 of the presence of the bug on two specimen of the Common Yellow Bat *Scotophilus kuhli* gains in importance. The bats were taken singly from holes in two cocoanut palms in a village near Tellicherry and were badly infested. Captain Patton, I. M. S., who kindly identified the bugs as *Cimex rotandatus* desired me to collect more bats of the species, but pressure of work of a different kind has left me little leisure to do it and I venture to publish this note in the hope that it will induce others interested to look for the bats and the bug on it.

I may mention what struck me as curious at the time that the bugs were on the bats themselves, rather an unusual habit for the insect. Perhaps the reason was that it was 7 A.M. when I caught them and the bugs starving over night had started just then to feed. The cocoanut trees were about 30 yards from human habitation. The holes on them could not be examined.

K. KUNHIKANNAN, M.A., F.E.S.,
Assistant Entomologist, Bangalore.

BANGALORE, August 24th, 1912.

No. XXXII.—FLIES ON SNOW.

On the snow covered slope of a glacier in Kashmir at approximately 15,000 I noticed that part of it, which I was ascending, was discoloured by what seemed to be a coarse, blackish dust, the snow elsewhere being clean and white. My eyes being fixed on this discoloured snow as I climbed, it suddenly dawned on me that the particles of 'dust' were in motion, jumping, and constantly shifting position. At first the thought occurred that I must be suffering from a severe 'go' of vertigo or mountain sickness,

but closer scrutiny revealed the fact that what I had taken to be dust was, in reality, a swarm of minute *diptera*. These tiny flies were thickly peppered over the snow for a space of 100 square yards or more, and apparently preferred to stay where they were or else were incapable of removing themselves by flight. How they got there, or into the predicament in which I found them, is difficult to conjecture, but if I might hazard a guess, I should say they had been wafted in a swarm, in a warm strata of air, from the valley beyond, and, suddenly meeting with the cold air above the glacier, collapsed and fell on the snow in a body.

KASHMIR, July 1912.

H. A. F. MAGRATH, LT.-COL.

No. XXXIII.—PRESERVATION OF GAME.

Some notes by Capt. Mosse on Mr. Hick's "40 years among the wild animals of India" have induced me to give a few details and make a few suggestions on the subject of game preservation.

Owing to the courtesy of a former Manager of the Court of Wards, I had, in 1911, the opportunity of shooting in one of the largest of the Zamindarys of the Central Provinces. My primary object was to secure a couple of good heads of that fast disappearing race—the C. P. Buffalo—and anything else, provided it did not interfere with my securing these.

The Zamindary has an area of something over 2,500 square miles and I had the opportunity of going over some 1,500 of this and in the localities where it would not be unreasonable to expect to see game fairly plentiful. If it had been during the cold weather that I went over this splendid piece of country, there might have been the argument—difficult to overcome—that one could not expect to find game universally plentiful over such a large area of, except for village sites and deserted village sites, uninterrupted jungle. I was however there during the months of April, May and June. At that time of year till the break of the rains, water is very scarce and there are frequently several miles between one patch of water and the other and if there were game about, their tracks would be found at the water. Although continually about before sunrise, I did not come across a single chital and only once a sambar and that was on the borders of Government forest whence it had come a few hundred yards to feed and where it returned at daybreak. There were several things which appeared to me to be conducive to this state of affairs.

(1) *The Native licensed to have a gun.*

In order to show how this man does the greatest amount of harm and the least amount of good: I should note that in this part of the country there is one harvest of rice, which is sown at the commencement of the rains and reaped in September or October. Protection of crops is the excuse for a gun in many cases and a very legitimate excuse too, provided the use of

the gun was limited to that. Shooting animals over crops gives both man and animal a sporting chance, anyhow in the estimation of the native and neither crops nor animals would be much the worse. The native however looks a bit further ahead and works out the simple problem that if there are no animals to shoot there will likewise be none to eat the crops. He, therefore, during the hot weather, when water is an absolute necessity and sport (for him) an absolute certainty, sits over the very limited numbers of water holes and makes use of his gun till there are no animals left to shoot. Now it appears to me that there are not insurmountable difficulties to get over and that a little local and if not sufficient, provincial legislation would make this state of affairs impossible. Let the protector of crops have his gun while his crops are in the ground and until they are reaped, which in most cases would be for four months—June, July, August and September. Let the native shikarry also have his gun for those four months as well and he will be able to pit his cunning against that of the unfortunate deer and the results of his labour will be sport and not slaughter.

(2) *The village nets.*

These nets, kept in every village inhabited by Mariahs, and in many other villages as well, are capable of catching any thing from a sun bird to a full grown Nilgai. It is probable that these are not on view in the same way when an official of the district is on tour, but in no case did they consider it necessary to put them away on my approach. I met a Mariah one day in the jungle and he explained their method of shikar with nets. Villages band together, bring out all their men and all their nets. After having arranged the nets in a run where animals pass, the jungle is beaten towards these and any flesh is good for the Mariah pot. The man told me that they had had a large beat a few days before, for miles around, but had not seen anything. It is not difficult to understand that game of all sorts under these circumstances must soon cease to exist. As far as I could ascertain the sale of flesh is not the object in these wilds, but the animals secured are divided with strict impartiality between those concerned in the beat. I was a witness of one of these partitions and the sport obtained was a jungle cat, a most unwholesome looking animal, but this was carefully divided up and put on leaves in a row. Nothing was wasted and the last of the flesh was being scraped off the cheek and carefully put aside for some one when I came up.

No doubt animal product is the property of these primitive jungle fellows, but their methods are those of extinction and if they are not restrained all animal life is bound to die out. The thriftless constructor is prevented from ruining the jungle at the expense of Government or the State and in his own interests the jungle man should be restrained from exterminating game on which he partly exists.

I also had occasion to see how birds fared at the hands of these ignorant

folk. Within a few miles of where I was one day camped, the pugs of a tiger had been seen in a dry water course in which there were two small pools of water where apparently the animal had drunk on the previous night. I intended to tie up in the water course and see if I could get the tiger. I went down in the afternoon and found that round the first pool branches of trees had been arranged to scare birds and prevent them from drinking there. At the second pool the same had been done and also a small hut of green boughs had been erected a few yards from the pool. In this case, however, a wet patch of sand had been left to entice thirsty birds on a sultry afternoon in the middle of the hot weather. Hidden just under the surface of the sand, was a jointed wooden frame working in the same way as a spring trap, with fine netting on either side of the frame. This frame was connected by a long cord to the hut in which the bird catcher and his son sat. By pulling the cord, any unfortunate bird up to the size of a peacock was secured the moment it put its feet on the enticing piece of wet sand. There is nothing to prevent the jungle man catching his birds in this manner and one might just as well talk to him of the evolution of the aeroplane as attempt to reason with him concerning extermination. When I got up to the pool I asked to see what sport they had had and in the hands of an urchin of some 8 summers were the plucked remains of 3 unfortunate still-fluttering birds, one of which was the beautiful male *Pitta brachyura*. I put an end to their sufferings as speedily as possible. I felt it my duty, although I cannot flatter myself that it would have any lasting effect, to protest against the needless barbarity of plucking these unfortunate birds alive and after thoroughly explaining to the man my reasons, destroyed the trap. I sat up that evening and no tiger came, but the hen of this lovely thrush (*Pitta brachyura*) was hopping round picking up insects and with those dark patches like large tear drops looked as if she was mourning the cruel fate of her mate.

A plea for the Central Province buffalo.

I do not think any one will dispute the fact that this splendid animal is fast disappearing and sportsmen of former years would turn in their graves were they be acquainted with the conditions that now exist.

In conversation with a well known sportsman, a forest officer, some time ago, the subject of preservation of buffalo cropped up, and I remember him saying that it was very disheartening, as a stock of these animals may have been preserved and looked after for years only to be wiped out by some cattle disease which may attack them at any time. It appears to me now that this risk might be lessened and possibly entirely avoided the part of the country frequented by these animals consists of undulating plains of grass and scrub jungle and are the grazing grounds of thousands of cattle brought into the country from the Deccan by "Banjaras" (a

wandering tribe) at the commencement of the hot weather and they remain till the break of the rains. There is not a corner of this vast area, where there is grazing, where these men and their herds do not penetrate. If cattle disease were introduced, it would more likely emanate from these cattle than from any other source. But these wandering tribes having paid their 2 annas a head (I think it is) for each animal are at liberty to wander at will and it is difficult to disassociate poaching, theft, or any other rascality from a member of a wandering tribe, although cattle-grazing may be his ostensible means of livelihood. There are parts of a jungle where buffalo will remain throughout the year, provided they are not rudely disturbed and there are parts which they never frequent or only pass through during the rains. Knowing these areas, surely it would be possible to close those they frequent to all grazing, and the areas would not be very large. This would give the buffalo a chance, his water would be left alone and the chance of him being killed off by cattle disease would be greatly diminished. I obtained one head of the C. P. buffalo a photo of which may be considered sufficiently interesting to reproduce in the Journal. I have no intention of visiting this part of the country again, but if what I have seen, and any



suggestion I have made would lead to preservation of game, especially of the buffalo, I shall not have written in vain.

ST. G. de CARTERET.

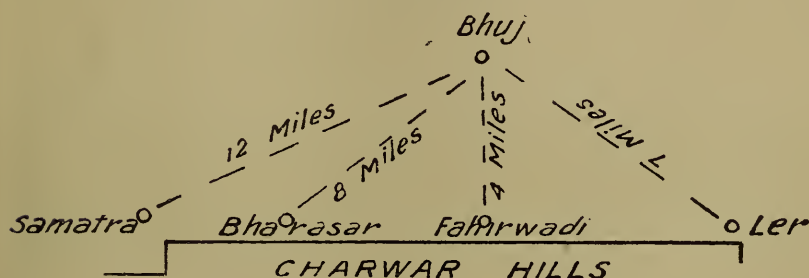
July 1912.

No. XXXIV.—NOTES ON CUTCH AMMONITES.

II

In my last notes, on the Fakirwadi Belteram beds, I drew attention to the peculiar arrangement of the hills bordering the great Cutch fault. They fall into a string of circles, semicircles and curves so much so that one is sometimes inclined to think that there is not so much fault here as a steep dive of the North side of an anticline under the later beds. However in other places the fault theory seems more probable. Possibly the formation of the fault had a good deal to do with the circling of these hills.

This 'Circling' is not confined to the Fakirwadi beds.

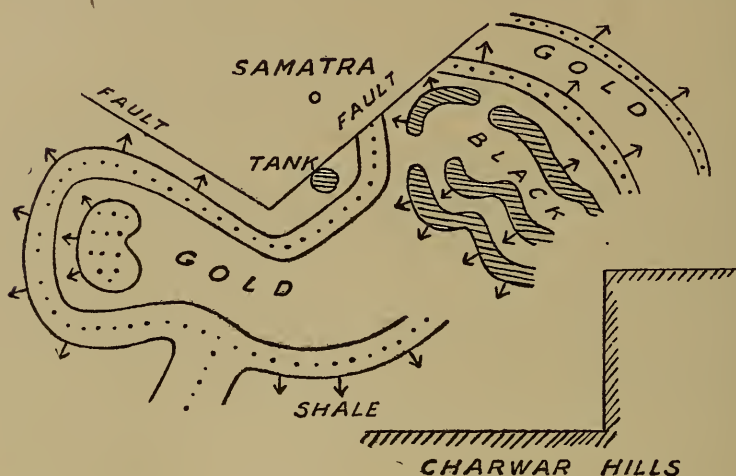


At each of the places named, Samatra, Bharasar, Fakirwadi and Ler I find the Ammonite ridges or hills turned in curves or circles, the North descent of the anticlines being often visible (perhaps only as a low broken off outcrop) dipping steep North and often clean gone, as if the curved hill had been shorn down across its middle by a fault.

Of Ler more later: of Fakirwadi I have written: of Bharasar this much at present: the outcrop here bends round at its East extremity in a most graceful curve: you might call it the end of a stadium. The South side dives under Charwar, the East dives down Eastwards, and the North side dives down to the North for a few hundred yards and then disappears. How far the Southerly exposure extends towards Samatra, I cannot say; I have followed it out for about $1\frac{1}{2}$ miles, and it was still running Westward when I left it.

To-day I write of Samatra, which again has its circle or stadium. The shape of the Samatra outcrops of Ammonite beds is roughly this. A sort of 2 mile long stadium. Its beds dip quaquaversally, but I am not quite sure how far they extend to the South-East and South-West. All the

West side is a plain of golden yellow soil, except where a basalt intrusion has forced up the rock (and hardened it) into a biggish pile of hills.



From this mass of hills the yellow fields and slope away to the East, till crimson black slabs come sloping up from under the yellow fields and rise into high hills at the East end of the stadium, break off into very rough and tumbled ground and sink down again below a broadish yellow belt. Here too in one place are some hummocks of basalt, the intrusion of which is probably responsible for the upheave. At the South-East corner the hills rise up and join a projecting angle of the Charwar range: but I have not yet had time to study the junction point.

To the West and South except for a South-West extension for a long way not yet mapped the wet blanket of shale-coated with small broken red stone covers up the warm yellow beds, just as it does on the South side of the Fakirwadi beds: on the North side, the line of the fault is visible, hard cold coarse sandstone dipping South, *i.e.*, against the Ammonite dip. To the East the yellow beds of Ammonite extend to some distance yet fully explored. I call the shale beds a wet blanket because you may hunt for hours in them and find nothing.* Its deposition seems to have cut off all (shelly) life.

* In a bit of coarse sandstone of the *upper* Jurassics lying apparently a fair height above the shale beds I have to-day found the relics of an Ammonite so perhaps *Ammonites* did struggle through the shale period: anyhow they must have done so to continue through into Cretaceous times, unless as I sometimes think these masses of shale beds and upper jurassic sandstones are contemporary with the European cretaceous deposits. But there has been an intrusion of basalt not far off the spot, which may have carried up some of the Ammonite rocks through the overlying shale and sandstone left this waif here.

One peculiar feature of the ground is the curve which indents the North side. There are several low parallel walls—the outcrops of the harder Ammonite strata—running along the North edge; but they curve at right angles at this point: each of them—as do also the sandstone beds to the North. There was a bad kink in the fault here.

We must then suppose that at one time the whole stadium was a vast hill; all its centre has been eroded, and has probably become much more so in the last 31 years: anyhow a very low ridge is marked in the Trigonometrical Survey Map which certainly doesn't deserve a contour line, now but then other hills deserve a contour line, which do not get it.

Basalt heaved up the West end: basalt heaved up the East end. Now the hills of the East end are of crimson-black rock, weathering on their inner faces into light yellow grit, while their broad slabby backs remain black and grim as contrasted with the golden yellow of the main stadium. They are of lower, earlier, deposit: and I presume Dr. Waagen refers to these when he writes of the *Anceps* beds of Samatra. I found two or three *Anceps* among them and several other *Interrupti Perisphinctes*, which I could not name. They also contain many biggish flat broad-trimmed *Ammonites* for which I can get no satisfactory name from the list of those supplied to Dr. Waagen.

The lowest beds visible in the lowest part of the hollow of the Eastern clump of hills seem to be of a dirty white sandstone—beds lying almost level—with, it seems, no fossils. Above them belemnite bearing rocks appear: these also contain very big *Rhynchonellæ*. At one spot on the outer edge of these black rocks there is a whole swarm of these big *Rhynchonellæ*. Embedded in the black rocks on the slabby side can be seen many big specimens, much worn and inextricable. One looked to be a long ribbed *Stephanoceras*. Another specimen was a big *Aspidoceras* (as far as I could judge). Its upper surface was worn almost flat and squat with the rock: I barely noticed it: but I did and I set to work carefully and long. As I removed the surrounding matter, it broke up. On unearthing a big outer fragment, I found strong straight even ribs, which from its shape and volution pointed to an *Aspidoceras*. It was 22 inches across and I much lamented its loss.

A big *Rehmanni*† was also found not far off. Above the black rock comes the golden yellow, which I consider to be *athlete* beds for in the lower parts of the deposit I found many *athlete* fragments. There were also large numbers of *Perisphinctes rota* many *Per. dhosaensis*, great numbers of fragments of *Stephanoceras opis* (at least I can see no other *Stephanoceras* in Waagen's book to which these fragments answer): unfortunately I found no specimen with inner whorls: *Stephanoceras polyphemus*, *tumidum*, and *diadematum*, *Per. curvicosta*, *angigaster*, and *Indogermanus* and

† Now in the B. N. H. S. Museum: a fine big fellow.

Harpoceras eairense and *dynastes*. One well preserved *Echinolampas* (*discoïdes*?) was found here too; if the identification hazarded by Mr. Stone is correct, this is a rarity in so low a bed.

In the hills on the west of the Stadium there is one corner in which good specimens of *Harpoceras Dynastes* abound. And another odd feature of these West hills is the great abundance of small *Ammonites*, evidently cut off by early death: perhaps the basalt rose and poisoned or heated the water while these beds were still forming, for these seem to be the highest of the ammonite beds here exposed. Their flat slabby backs slope down to the cold red stone beyond.

There are hundreds—probably thousands—of these immature examples exposed, though the majority are in fragments. I cannot be sure yet of any having their body chamber preserved; but there is no sign of any outer whorl having covered those now exposed. I promise myself and Mr. Stone an exciting time in examining these and guessing into what class of monster each would have grown.

And so this chapter of ancient life seems to begin in a jump with plate-like *Ammonites*, *Belemnites* and big *Rhynchonellæ*. Probably their ancestors lie crushed and powdered in the dirty-white rock of the lowest visible stratum. And they pass on through centuries of evolution into slightly varying forms, the old ones dying out and leaving descendants unlike themselves to start ever more widely differing branches. Suddenly while the waters are teeming with the life of these beautifully-shelled animals, there comes a bubbling up of hot or poisonous basalt. The waters get hot or poisonous and kill off all. The mud, till now flat and level, is heaved up into mounds and hills, and the whole mass is raised above water level into a small island.

One more point for notice: the Fakirwadi upper beds overlying the reefs with Samatra like species, contain many *Perisphinctes*, *Oppelia* and *Phylloceras*: but the Samatra beds have not yet these upper layers: I have found none of the *Perisphinctes* so common to the upper Fakirwadi levels. (*torquatus*, *Katrolensis*, *Pottingeri*, &c.): possibly a few *Oppelia* in the Samatra upper beds, but so worn as perhaps to be *Harpoceras*: and one possible *Phylloceras* which refuses to budge from his compact rock-setting. So I think we may assume that these Samatra beds were clear of the water when the upper Fakirwadi beds were being laid down under water. But where did the water-line come? If it still washed the base of the hills sketched above, the *Oppelia*, *Phylloceras* and later *Perisphinctes* should be found under the cold red-stone shales round the edges of the raised island. This question must be solved by a close examination of the nullahs cutting through the cold red-stone shales; and this must wait a bit.

J. H. SMITH.

BHUL, CUTCH, July 1912.

P. S.—The *Nautilus* and *Ammonite* specimens have been, as far as possible, identified by reference to Dr. Waagen's work on the Jurassic Cephalopoda of Cutch. (Pal. Indica Ser. IX. 4. vol. I. Pts. 1-4.). Several specimens discovered do not seem to tally with any given in Dr. Waagen's work : these are now awaiting identification.

Among the specimens from Samatra, as yet identified by Mr. F. H. Stone, are the following :—

<i>Belemnites grantianus</i> ¹ .	<i>Stephanoceras tumidum</i> ³ .
„ <i>gerardi</i> .	„ <i>polyphemus</i> .
„ <i>katrolensis</i> ² .	<i>Perisphinctes hians</i> ⁴ .
„ <i>sauvanaus</i> .	„ <i>rehmanni</i> .
<i>Amaltheus schauburgi</i> .	„ <i>curvicosta</i> .
<i>Harpoceras dynastes</i> .	„ <i>sparsiplicatus</i> ⁵ .
„ <i>lairens</i> .	„ <i>angygaster</i> .
<i>Peltoceras athleta</i> .	„ <i>dhosaensis</i> .
„ <i>bidens</i> .	„ <i>omphalodes</i> .
	Also a <i>Pleuromya</i> .

- NOTES :—(1) *Belemnites grantianus* is mentioned in R. D. Oldham's Manual of the Geology of India, page 224, also in a footnote on same page as having been overlooked by Dr. Waagen in Jurassic Cutch Pal., Indica Series IX.
- (2) *Bel. katrolensis* being found in these beds shows that this species had its origin earlier than was known to former surveys.
- (3) *Steph. tumidum* found in upper *Athleta* or *Dhosavolite* (the dividing line is not clear to me) shows a later extension in time than was formerly believed. Dr. Waagen allocated it to *Macrocephalus* beds only.
- (4) *Per. hians* also seems to continue much later than was supposed. It was formerly assigned to Putchum beds (*Bathonia*). Here it is found in *Callorian*.
- (5) *Per. sparsiplicatus* was only known in Katrol beds. There is no sign of Katrol beds here.

* * *

Mr. R. C. Burton, of the Geological Survey, Calcutta, has kindly examined the large number of small *Ammonites* referred to in the above article. He, however, reports that the specimens are too badly preserved for safe identification. They are limonite casts. However, he is inclined to believe that several which I had marked "*Oppelia*?" are real *Oppelia*, a point which is interesting, as *Oppelia* are so very rare (or absent) in the Samatra beds ; and these small specimens found in the upper strata may have been the precursors of a revival of the family. Large swarms existed in the Katrol seas.

* * *

Mr. Stone has added the following to my Fakirwadi list :—

Oppelia glabella.	Perisphinctes orion.
„ bicostata.	plicatilis.
Harpoceras lunula.	frequens.
„ ignobile.	chloroolithicus.
„ lairensis.	Indogermanus.
Peltoceras bidens.	præcursor.
„ athleta.	euplocus.
Aspidoceras iphiceroideis.	altiplicatus.
Stephanoceras subtumidum.	rota.
„ diadematum.	sparsiplicatus.
„ semilæve.	spirorbis.
Also Monttivaltic chariensis.	jooraensis.
	leiocymon.
	angygaster.

On the other hand, some of my indentifications (Vol. XXI. No. 2) must for the present be crossed out, *viz* :—Opp. orientalis, Harp. trilineatum and hecticum, Asp. diversiforme and Wynnei, St. maya, macrocephalum, and fissum and Per. paramorphus.

The Fakirwadi beds extending about 250 yards horizontally thus contain *Anceps*, *Athleta*, Dhosa Oolite, Kuntkote (?), and Katrol beds.

The question naturally arises as to what formation the masses of shale and sandstone which overlies the Katrol beds (Tithonian) belong to? Dr. Waagen in the G. S. I. Records, Vol. IV., Pt. 4., 1871, moots this problem. Are they Cretaceous, and included in the 3,000 feet thick Umia beds of Mr. Vredenburg's Summary?

J. H. SMITH.

NO. XXXV.—AMMONITES FROM CUTCH.

This sketch is meant to outline the probable history of the area during the Jurassic period and later, and to explain some of the points raised by the author in his paper (page) entitled "Notes on the Cutch Ammonites."

In a Jurassic sea, the rocks containing the "Belteram" fossils were laid down. The sea was deep and little or no movement occurred in that area; *Ammonites*, *Belemnites* and other deep-sea forms flourished and their remains were entombed where they lived.

A period of protracted earth movement began, the sea commenced to shoal slowly, allowing a deposit of fine, argillaceous material to collect over the "Belteram" beds. These conditions were probably not favourable to the existence of the *Ammonites*, &c., and they therefore moved into deeper

waters and to places on the deep-sea bottom where the conditions were more congenial to them and deserted the places where they formerly lived.

Occasionally, during this period of slow elevation, movement was arrested, the sea deepened and for a space, similar conditions to those that prevailed when the "Belteram" zone was being laid down, induced a few *Ammonites*, *Belemnites*, &c., to return and the remains of some of them are found where they died. The uplifting movement began afresh and the survivors fled when the argillaceous material began to envelop them again.

As the sea shallowed sufficiently to bring the area within the "Thalassia zone" of deposit, the sandstones of the Upper Charwar Age and of the Upper Jurassic Epoch were laid down over the Charwar shales.

The processes of sedimentation and movement kept pace till all the beds of Upper Jurassic age exposed within the area were laid down and then the crushing was accentuated and folding, along an axis parallel to the existing shore-line began, resulting in an anticlinal fold that was faulted along its crest when the movement became more intense.

About this time probably, the Charwar range came into being along the fault-line, as a faulted shale anticline forming a sea-cliff. Denudation removed this cliff backward, the sea encroached and planed down the shales, exposing the in-lier of "Belteram," which now formed part of the sea bottom.

Boulders were torn from these beds by the waves and dragged back and forth and left at various points of the sea bed, composed of the white Bhuj sandstones. The sea floor was finally elevated and the "Belteram" beds exposed in intimate contact with the white sandstones, along a line of fracture down throwing to Northward, that ran along the Belteram anticlinal.

As the movement became concentrated and localized along the fault, a series of domes were formed along the fold and gave rise to the line of circular hills referred to.

The fault often cuts along the crest of the fold and the fossiliferous, dark crimson, vanguard ridges, are probably the lowest beds exposed within the area.

The "Belteram" in-lier itself, forms an elongated dome, allowing the overlying Charwar shales to come in against the fault in the Nulla beyond the Barapur road.

The shales and "Belteram" beds exposed on the Bhuj side and beyond Dhonsar, are evidently the same series that form the Charwar range and "Belteram" hills, outcropping from below the Bhuj sandstones across the fault.

H. J. DAVIES, F.G.S.

CAMP LEDAUNG, 17th August 1912.

NO. XXXVI.—THE TRINOMIAL SYSTEM OF NOMENCLATURE.

To open any discussion on “nomenclatorial questions” is, we know, treading on exceedingly delicate ground, but the subject has recently assumed such vast importance for all Naturalists that, it is felt that the time has now come, when it can no longer be shelved.

In a very remarkable book entitled “A Hand-List of British Birds” by Hartert, Jourdain, Ticehurst, and Witherby (published by Witherby and Co., London, 1912), a most thorough attempt has been made by the authors to settle, let us *fervently* hope once and for all, the vexed question of nomenclature. Each bird has, in this work, been assigned its correct scientific name in conformity with the Rules of the International Commission of Zoological Nomenclature. That this will now lead to uniformity can hardly, we think, be doubted. The uniformity, however, to be useful must be universal, and this universality can alone be arrived at by a strict adherence to the *letter* of the Law of Priority, against which there must be no appeal. It is only too notorious that the existing confusion has hitherto arisen by authors having systematically disregarded this important principle and individual tastes and fancies thus having been given free play, the same bird has been redescribed under different names. In the circumstances is it surprising when we see in text-books a mass of synonyms tagged on to each species?

That a large number of birds exhibit sub-species—by which term we mean not a “species in the making”, but a “*varietas geographica*”, a geographical race—will not be denied; and Ornithologists of the present day are fully alive to the great importance of the separation definitely of nearly allied forms of the same species. It is here that the Trinomial arrangement comes into play; and its use, not only helps us to speak with absolute precision of a particular race of birds, which have hitherto been binomially merged into other allied forms, but also helps to demonstrate scientifically the close relationship existing between geographical races of the same species.

The International Rules of Zoological Nomenclature clearly lay down how specific and sub-specific names shall, in the future, be accorded, and if universal uniformity is one of the desiderata, then there can no longer be any excuse for not adopting the principles everywhere. Henceforth (Article 2) the scientific designation of animals will be Uninomial for subgenera and all higher groups, Binomial for species, and Trinomial for subspecies. The Law of priority (Article 27) lays down that the *oldest* available name, even though it be inappropriate (Article 32), or “indicate characters contrary to those possessed by the animals in question” (Article 33) shall be adhered to. Doubtful cases, should any such arise, will have to be cleared by careful nomenclatures, with the help of the

International Commission, which discusses doubtful cases, and brings them up finally before the International Zoological Commission for decision. Unsightly tautonymy, such as *Apus apus apus*, or *Troglodytes troglodytes troglodytes*, is of no moment (Article 33).

As some doubts exist in regard to the use of trinomials for subspecies (geographical races), the authors of the "Hand-List" explain that when a species is divided into two or more races, or when two or more species are grouped as races of one species, then each of these races must have a trinomial appellation. It being impossible to say which is the oldest or parent form, the first named race of all those grouped under one species is, therefore, arbitrarily taken as the typical race, and its name becomes that of the species.

Applying these principles to a specific case, let us take that of the Raven as an example, and see how the revised nomenclature, in regard to the Indian birds, works out. The *typical* race of this Raven must, if it is to be distinguished from the Tibetan or Punjab birds, be designated *Corvus Corax Corax*, Linnaeus. As Hodgson was the first Naturalist to describe the Tibetan race under the binomial "*Corvus tibetanus*", then this, we take it, becomes, under the new Rules, *Corvus corax tibetanus*, Hodgson. Similarly as regards the Punjab Raven. Hume originally described this as "*Corvus lawrencii*", and it would now become *Corvus corax lawrencii*, Hume, and so on for other races.

This "splitting" of species will doubtless be very distasteful to the old school of "lumpers", but its advantages in leading to a more exact knowledge of the distribution of birds can hardly be overestimated. We notice that the reformed system of nomenclature has been adopted by Messrs. Baxter and Rintoul in their Report on Scottish Ornithology for 1911, and it is apparently only a question of time now before it comes into general use. That we must now all fall into line and revise our labels is inevitable, but will it be too much to hope that our Society will take early steps, in consultation with experts in Europe, to help their field workers by having the binomial system of nomenclature used by Blanford in his *Aves* thoroughly overhauled, and by issuing a Hand-List of revised scientific names as required by the International Zoological Congress? In such a "List" the synonymy need be as brief as possible; references being simply given, as in the "Hand-List of British Birds", to the earliest names, and the typical locality for the bird described under that name.

P. T. L. DODSWORTH, F.Z.S., M.B.O.U.

SIMLA, S. W., 22nd August 1912.

[We understand that a revised list of the birds of India giving the various races is in preparation by one of our members at home.—EDS.]

No. XXXVII.—CRUELTY TO WILD FOWL IN SIND.

With reference to the note on this subject by Captain C. H. Elliot in the last Journal, page 1083, and to the editorial note at the end, the following satisfactory letter has been received by the Society from Mr. A. D. Younghusband, C.S.I., I.C.S., Commissioner in Sind, dated the 27th June 1912 :—

“I have the honour to refer to correspondence ending with your letter of the 12th February 1912, on the subject of cruelty to water fowl on the Manchur Lake, which has been very fully considered and discussed with the local officers.

2. I find that the question was taken up some years ago, resulting in the extension to the locality of the provisions of Section 62 of the Bombay District Police Act (IV of 1890) and of Section 3 of the Prevention of Cruelty to Animals Act (XI of 1890), which runs as follows :—

Section 62, Bombay Act IV, of 1890.

62 (1) Whoever cruelly beats, goads, overworks, ill-treats or tortures, or causes or procures to be cruelly
 Punishment for Cruelty to animals. beaten, goaded, overworked, ill-treated or tortured any animal, shall be punished with imprisonment which may extend to one month, or with fine which may extend to one hundred rupees, or with both.

(2) Jurisdiction in cases arising under this section shall not be exercised by a Magistrate of lower rank than the first class unless such Magistrate be specially invested with jurisdiction for that purpose by Government.

Section 3, Act XI, of 1890.

Penalty for cruelty to animals in public places and for sale in such places of animals killed with unnecessary cruelty.	3. If any person in any street or in any other place whether open or closed, to which the public have access, or within sight of any person in any street or in any such other place—
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|--|--|
| (a) cruelly and unnecessarily beats, overdrives, overloads or otherwise ill-treats any animal, or
(b) binds or carries any animal in such a manner or position as to subject the animal to unnecessary pain or suffering; or
(c) offers, exposes or has in his possession for sale any live animal which is suffering pain by reason of mutilation, starvation or other ill-treatment, or any dead animal which he has reason to believe to have been killed in an unnecessarily cruel manner, | |
|--|--|

he shall be punished with fine which may extend to one hundred rupees, or with imprisonment for a term which may extend to three months, or with both.

3. Difficulties have however been experienced in the practical enforcement of these provisions of the law. It is one thing to be able to state that cruelty has been practised. It is another thing to produce such precise evidence against a particular individual of all the facts required to constitute a technical offence as will suffice for his conviction in a criminal court. Moreover there are certain doubtful points connected with the interpretation of the law. Such doubts can best be determined by the institution of test cases, and attention is being directed to the desirability of instituting them whenever opportunity arises.

4. It has now been arranged that in future the annual licenses granted for the capture of water fowl shall contain express conditions prohibiting all such cruel practices as that of breaking the birds' wings while alive. A proclamation is in course of issue to the public of the locality, warning them that such practices are illegal, and that the law will in future be strictly enforced against all persons resorting to them. And the local subordinate officials are being instructed to see that the warning is not disregarded.

5. The matter is one in which the co-operation of visiting sportsmen will be specially welcomed by the district authorities, and I shall be grateful if you can help, in enlisting such co-operation. It would be of the greatest assistance if any visitor under whose notice an act of cruelty may come would (1) make a full note at the time, of all relevant facts, including the names and descriptions of the offenders and of any witnesses, (2) give immediate information to the nearest Magistrate or police officer, (3) report by letter to the Collector of Larkana."

We are sure that all bird lovers and sportsmen will appreciate the action of the Commissioner in Sind in regard to the above matter, and it is hoped that all sportsmen will co-operate with the district authorities as suggested by Mr. Younghusband.

September 3, 1912.

EDITORS OF THE JOURNAL.

PROCEEDINGS

OF THE MEETING HELD ON 27TH JUNE 1912.

An "At Home" of the members of the Bombay Natural History Society took place on Thursday, the 27th June 1912, Dr. A. H. Deane presiding.

NEW MEMBERS.

The election of the following 51 members since the last meeting was announced :—Capt. E. G. J. Byrne, Bombay ; Mr. E. C. H. Condon, M.I.E., A.M.I.C.E., Bandra, Bombay ; Rev. W. S. Sutherland, Kalimpong, Darjeeling ; Mr. S. H. Covernton, Larkhana, Sind ; Mr. M. T. Kennard, London ; Mr. C. Saunders, Calcutta ; Mr. J. B. Lloyd, Calcutta ; Mr. W. G. Leys, Bahraich, Oudh ; the Mess President, King's Liverpool Regiment, Lahore Cantonment ; the Principal, Larkana Madrassatul-Islam, Larkana, Sind ; the Honorary Secretary, Arthur Library, Castle Rock ; Capt. E.D.F. Kelly, England ; Mr. G. O. Allen, I.C.S., Mirzapur, U. P. ; Capt. Gordon G. Jolly, I.M.S., Kacha, *via* Nushki, Baluchistan ; Mr. G. T. Barlow, Jhansi, U. P. ; Mr. Humphry Nevill, Phillaur, Punjab ; Major L. L. Maxwell, London ; Mr. G. N. Kingsford, C.E., Calcutta ; Mr. C. F. Reeve, Nasrapur, Poona Dist. ; Capt. L. A. Bethell, Dibrugarh, Assam ; Dr. S. N. Gore, L.M. & S., Agra ; Dr. J. M. O'Connell, Mannar, Ceylon ; Rev. H. Fairbank, Ahmednagar ; Mr. H. C. Robinson, Director of Museums, Kuala Lumpur, F.M.S. ; Maharaj Kumar Shri Vijayarajji, Bhuj, Cutch ; Mr. C. V. Birch, Bombay ; Lt. E. B. Fawcett, Port Blair ; Mr. John A. Wood, Kelantan, *via* Singapur ; Mrs. Leslie James, Mandalay, Burma ; Major B. E. M. Gordon, Manpur, *via* Mhow, C.I. ; Mr. A. Oliver, Swatow, China ; Rajkumar Hari Singh of Kashmir, Kashmir ; Mr. C. G. Stewart, Tharrawaddy, Burma ; Mr. Chas. Cook, Edinburgh ; Mr. H. H. M. Spink, Ahmednagar ; Capt. Norman Leslie, Darjeeling ; Major H. F. Thuiller, R.E., Ahmednagar ; Mr. L. Bishop, Hutti P. O., *via* Raichur, Deccan ; Capt. E. J. C. MacDonald, I.M.S., Balek, Abor Hills, Assam ; Mr. S. Hanhart, Bombay ; Mr. Frank E. Rice, England ; Mr. B. J. Gould, I.C.S., Gyantse, Tibet ; Mr. Alister Forbes, Bombay ; Mr. G. B. Lambert, I.C.S., Bijnor, U.P. ; Mr. A. P. Kinloch, Pollibetta P.O., South Coorg ; Mr. L. P. Hutchison, Gonda, Oudh ; Mr. A. C. Tunstall, Calcutta ; Miss Annie L. Skinner, Honorary Secretary and Treasurer, Natural History Society of Malaya, Kuala Lumpur, F.M.S. ; Mr. J. C. Stodart, I.C.S., Pollachi, Coimbatore Dist. ; Capt. W. Paget Tomlinson, Bangalore ; and Mrs. T. W. Birkett.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting:—

Contribution.	Locality.	Donor.
1 Urial, <i>Ovis vignei</i> (alive) ..	Persia ..	Capt. F. W. Townsend.
1 Four-horned sheep, <i>Ovis aries</i> (alive).		
8 Takin, <i>Budorcas taxicolor</i> , heads.		
1 Unicorn Sheep, <i>Ovis aries</i> ..		
2 Wolves, <i>Canis pallipes</i> ..	Mishmi Hills ..	Capt. F. M. Bailey.
7 Jungle Cats, <i>Felis affinis</i> ..		
1 Common Indian Civet, <i>Viverricula malaccensis</i> .		
2 Jackals, <i>Canis indicus</i> ..		
1 Mongoose, <i>Mungos mungo</i> ..	Khatmandu, Nepal	Lt.-Col. J. Manners-Smith.
8 Hares, <i>Lepus ruficaudatus</i> ..		
Skin and skull of Hybrid Lion and Panther.		
1 Clouded Leopard, <i>Felis nebulosa</i> .		
1 Skull of Lion, <i>Felis leo</i> ..	Siripur, Saran ..	Mr. M. Mackenzie.
1 Leopard Cat, <i>Felis bengalensis</i> .	Kolhapur dens.	Col. F. Wodehouse.
1 Jungle Cat, <i>Felis affinis</i> ..	Sadon, Shan Sta-	Mr. Chas. Gray.
4 Skulls of Desert Fox, <i>Vulpes leucopus</i> .	tes.	
1 Jungle Cat, <i>Felis affinis</i>	Junagadh dens.	Mr. L. Robertson, I.C.S.
1 Fishing Cat, <i>Felis viverrina</i>	Mongnai, Shan	Mr. L. E. C. Evard.
1 Jungle Cat <i>Felis affinis</i> ..	States.	
*2 Chital, <i>Axis axis</i> (alive) ..	Ferozepore. ..	Mr. H. Whistler.
1 Bear Cat, <i>Ælurus fulgens</i> ..	Motihari, Cham-	Mr. J. S. E. Walker.
2 Jackals, <i>Canis indicus</i> ..	paran.	
1 Hyæna, <i>Hyæna hyæna</i> ..	Chakdara ..	Capt. H. Graham.
1 Wild Boar, <i>Sus cristatus</i> (variety.)	Kanara ..	Mr. G. C. Shortridge.
1 Jackal, <i>Canis indicus</i> ..	Silchar ..	Mrs. F. E. Jackson.
4 Tiger, <i>Felis tigris</i> Cubs, foetal specimens.	Akola, Berar ..	Mr. C. H. Dracott.
6 Hares, <i>Lepus nigricollis</i> ..	Cutch ..	H. H. Rao of Cutch.
1 Ratel, <i>Mellivora indica</i> .	Mudhol ..	H. H. The Rao Sahab of Mudhol.
1 Black Buck, <i>Antelope cervicapra</i> .	Nilgri Hills ..	Mr. Chas. Gray ..
6 Bats, <i>Rhinolophus affinis</i> ..	Hoshangabad ..	Capt. W. F. Maxwell.
8 Bats, <i>Scotophilus khuli</i> ..	Wadhwan ..	Mr. S. A. Stripp.
2 Spot-billed Ducks, <i>Anas pæcioerhynchus haringtoni</i> .	Khatmandu ..	Lt.-Col. J. Manners-Smith.
	Pusa ..	Mr. T. Bainbrigge Fletcher.
	Taunggyi ..	Major H. H. Harington.

*Forwarded to the Victoria Gardens, Bombay.

Contribution.	Locality.	Donor.
1 Stiff-tailed Duck, <i>Erismatura leucocephala</i> .	Srinagar ..	Mr. M. T. Kennard.
1 Mallard-Shoveller (hybrid)		
1 Swinhoe's Snipe, <i>Gallinago megala</i> .	Chingleput ..	Mr. I. S. Fraser.
1 Swinhoe's Snipe, <i>Gallinago megala</i> .	Dinvi V a n a m, Madras.	Mr. R. F. Stoney.
1 Common Hill Partridge, <i>Arboricola torqueola</i> .	Khatmandu ..	Lt.-Col. J. Manners-Smith.
3 Eastern Bayas, <i>Ploceus passerinus</i> .	Bhutan, Duars ..	Mr. H. V. O'Donel.
3 Blue Winged Teal, <i>Querquedula ciria</i> .	Wardha ..	Lt. W. A. Tucker.
1 Barn Owl, <i>Strix flammea</i> ..	Bandra ..	Mr. Windgate.
19 Duck Skins of various species..	Srinagar ..	Hon'ble H. G. O. Bridgeman.
3 Eggs of Grey Jungle Fowl, <i>Gallus sonnerati</i> .	Chanda ..	Mr. A. H. A. Simcox, I.C.S.
1 Egg of Bengal Florican, <i>Syphætis bengalensis</i> .	Hasimara, Duars ..	Mr. H. V. O'Donel.
1 Nest of the Tailor Bird, <i>Orthotomus sutorius</i> .	Dinapur ..	Major J. W. L. Elgee.
1 Nest of the Purple Sun Bird, <i>Arachnechthra asiatica</i>		
2 Bird's Nests	Lucknow ..	Mr. J. Florence.
A large number of Fishes and Crustaceans.	Persian Gulf ..	Capt. W. F. Townsend.
2 Snakes, <i>Typhlops porrectus</i> .. }	Alipore ..	Major O. A. Smith.
1 Cobra, <i>Naia tripudians</i> .. }		
4 Common wolf Snakes, <i>Lycodon aulicus</i> . 3 Brown Tree Snakes, <i>Dipsadomorphus trigonata</i> . 1 Chequered Water Snake, <i>Tropidonotus piscator</i> . 1 Common Krait, <i>Bungarus cœruleus</i> , 1 <i>Hyppserhina sieboldi</i> and 4 Skins.	Pusa ..	Mr. T. Bainbrigge Fletcher.
Head of a King Cobra, <i>Naia bungarus</i> , which measured 16 ft. 4 ins.	Quilon ..	Capt. F. H. Branson.
5 Snakes and 3 Scorpions ..	Pasighat, A b o r Country.	Capt. R. S. Kennedy.
1 Johns Earth Snake, <i>Eryx johnii</i> (alive).	Ootocamund ..	Mr. C. B. Antram.
1 King Crab, <i>Limulus</i> sp. ..	Akyab ..	Comdr. A. R. G. Willock, R.I.M.
22 Fresh Water Sponges ..	Various ..	Indian Museum, Calcutta.
A few Fresh Water Medusa ..	Satara ..	Do.
A number of Shells and Fossils ..	Persian Gulf, Mekran Coast.	Capt. F. W. Townsend.
35 Butterflies	Ni giris ..	Capt. G. A. Hare.

Minor contributions.—Messrs. J. P. Paterson, Chas. Gray, C. Beadon, K. C. Macdonald, Capt. Massey, Mir S. Ali, C. E. Traylen, Major H. Robertson and Mr. P. F. Gomes.

MAMMAL SURVEY.

GRANT FROM BOMBAY GOVERNMENT.

The Secretary announced that he had just received a letter from the Government of Bombay intimating that Government had been pleased to sanction a special grant of Rs. 2,500 towards the funds for the Mammals Survey.

The survey is progressing satisfactorily. Mr. Crump is at present at Chanda, C. P., and Mr. Shortridge in Mysore.

The Superintendent, Victoria Gardens, Bombay, exhibited some plants of *Hemanthus multiflorus* in flower.

The Secretary exhibited a plant of *Peristeria elata*, the 'Dove' Orchid, in flower.

An "At Home" of the members of the Bombay Natural History Society took place on Thursday, the 26th of September 1912, Mr. T. R. Bell, I.F.S., presiding.

The election of the following 37 members since the last meeting was announced:—Mr. G. M. McCleverty, Dehra Dun, U. P.; Mr. E. Lane, Koderma, P. O.; Mr. W. E. Kidner, R. E., Bombay; Mr. G. N. Frattini, Bangalore; Dr. E. H. Hankin, Agra; Mr. H. Gill, Kallini P. O., Cachar; Capt. W. G. Meale, I.A., Mount Abu; Mr. W. W. Phillips, I.C.S., Madras; The Librarian, Gauhati Club, Assam; Mr. Aga Shah Rookh Shah, Poona; Mr. Carl Meyer, Rangoon; Capt. C. H. Barbar, I.M.S., Banda, U. P.; Dr. A. D. Cunnyingham Perdriau, Narsinghpur, C. P.; The Mess Secretary, R. A. Mess, Meerut; Major H. N. Holden, Jaipur, Rajputana; Mr. B. L. Clarke, Quetta; the Honorary Secretary, R. A. Mess, Campbellpore; Major James Davidson, I.M.S., D.S.O., Dehra Dun, U. P.; Mr. E. D. Knowles, Purulia, B. N. Ry.; Mr. T. R. Rearden, England; Capt. T. L. Bomford, I.M.S., Calcutta; The Mess President, The Border Regiment, Maymyo; Mr. E. H. P. Jolly, I.C.S., Jalgaum; Mr. E. Ferry, Benares; Mr. E. L. Mahon, Pollibetta, South Coorg; The Principal, Madras Forest College, Coimbatore; Major A. D. Kirby, R.F.A., Allahabad; Mr. H. Jouquet, Dehra Dun, U.P.; Mr. F. C. Chamier, I.C.S., Mirzapur; Mr. E. A. Macnee, Jubbulpore, C. P.; Mr. T. J. Tasker, I.C.S., Hospet, Dist. Bellary; Mr. S. H. Harman, Tavoy, L. Burma; Mr. J. W. Bradley, Katha, Burma; Mr. V. A. Mackinnon, Mussoorie, U. P.; Mr. Donald Fraser, Bombay; Mr. B. S. Hickey, Tateriah P. O., Champarum and Mr. A. W. Botham, I.C.S., Shillong.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum, since the last meeting :—

Contribution.	Locality.	Donor.
Panther (black variety) <i>Felis pardus</i> .	Siam	Mr. J. F. Keddle.
Desert Cat, <i>Felis ornata</i>	Cutch	H. H. The Rao of Cutch.
Burmese Civet Cat, <i>Viverra megaspila</i> .	Shan States ..	Mr. L. E. C. Everard.
1 Wolf, <i>Canis lupus</i>	Gumal, Baluchistan.	Lt.-Col. H. C. Bernard.
1 Tree-Shrew, <i>Tupaia</i> sp.?	Bhutan, Duars ..	Mr. H. V. O'Donel,
2 Large brown Flying squirrels, <i>Petaurista inornatus</i> .	Simla	Mr. P. T. L. Dods-worth.
4 Small Kashmir Flying squirrels, <i>Sciuropterus fimbriatus</i> .		
1 Parti-coloured Flying squirrel, <i>Sciuropterus alboniger</i> .		
8 Rats, <i>Epimys vicereis</i> , 1 Persian house mouse, <i>Mus bachtrianus</i> and several shrews and bats in spirit. }		
2 Squirrels, <i>Sciurus pernyi</i>	Siam	Mr. E. B. Howell.
15 Voles and Mice	Kashmir	Lt.-Col. H. A. F. Magrath.
2 Black naped Hares, <i>Lepus nigricollis</i> .	Coimbatore ..	Mr. C. E. C. Fischer.
Deformed head of Gaur, <i>Bibos gaurus</i> .	Kanara	Conservator of Forests, C. C.
2 Young Baral heads, <i>Ovis burrhel</i> .	Garhwal	Mr. J. C. Pickersgill Cunliffe.
6 Bird skins	Bhutan, Duars ..	Mr. H. V. O'Donel.
Masked Booby, <i>Sula cyanops</i> ..	Bombay Harbour.	Mr. E. R. H. Jackson.
White winged Wood Duck, <i>Asarcornis scutalatus</i> .	Siam	Mr. J. F. Keddle.
Scully's Wood Owl, <i>Syrnium indrani</i> .	Kashmir	Lt.-Col. H. A. F. Magrath.
Eggs and nest of Orange Bullfinch, <i>Pyrrhula aurantiaca</i> and nest of Sooty Flycatcher, <i>Hemichelidon sibirica</i> .		
2 Bird's Nests and Eggs		
Eggs of Koklas Pheasant, <i>Pucrasia macrolopha</i> .	Jansar	Mr. A. Rodgers.
2 Young Monitors, <i>Varanus</i> sp.?	Ceylon	Mr. F. H. S. Stone.
Head of King Cobras, <i>Naia bungarus</i> .	Thayetmyo ..	Mr. A. Bailey.

Contribution.	Locality.	Donor.
2 Young King Cobras, <i>Naia bungarus</i> .	Tindharia ..	Mr. A. Wright.
1 Golden Tree Snake, <i>Chrysopelea ornata</i> and one black Krait, <i>Bungarus lividus</i> .		
6 Snakes		
1 Painted Tree Snake, <i>Chrysopelea ornata</i> .	Kadra, Rajputana.	Mrs. Hume.
1 Brown Tree Snake, <i>Dipsadomorphus trigonata</i> .		
2 Snakes	.. Sikkim ..	Mr. C. H. Dracott.
11 Snakes	.. Jalpaiguri ..	Mr. W. L. Travers.
3 Snakes	.. Ootacamund ..	Mr. C. B. Autram.
Chameleon, <i>Chamelon calcaratus</i> (alive).	Nadiad ...	Mr. T. N. Jhaneri.
Young Hawks bill turtle, <i>Chelone imbricata</i> (alive).	Karachi ..	Capt. F. W. Townsend.
17 Fish and several other Lizards and spiders.	Charbar, P. Gulf.	Mr. W. D. Cumming.
1 Small crocodile, <i>Crocodilus porosus</i> (alive).	Kanara ..	Mr. G. C. Shortridge.
A number of frogs and toads	.. Simla ..	Mr. P. T. L. Dods-worth.
A number of insects	.. Singapore ..	Mr. F. H. Stone.
A large number of Butterflies	.. Nilgiri Hills ...	Capt. G. A. Hare.
Do. do.	.. Sikkim ..	Mr. C. H. Dracott.
A large number of Beetles	.. Charbar, P. Gulf..	Mr. W. D. Cumming.
Beetles and other insects	.. Maymyo ..	Capt. S. Pershouse.
Corals	.. Singapore ..	Mr. F. H. Stone.

Minor contributions from Messrs. S. A. Stripp, H. M. Dwane, H. V. O'Donel, E. Comber, J. F. Keddie, H. White, L. Bishop, L. Newton Davis, I.M.S., P.M.D. Sanderson, L. Robertson, W. R. Clarke, P. Gomes and J. F. Lopez.

MAMMAL SURVEY.

The Secretary said since the last meeting Mr. Crump had sent in 227 specimens from Chanda, C. P., and Mr. Shortridge 106 specimens from Shimoga and 331 from Vijayanagar (Humpi), Bellary District. Mr. Crump was now in Kathiawar collecting and Mr. Shortridge at Kolar, E. Mysore, from whence he proceeds to Coorg and the Malabar Coast. In regard to finances, the Government of India had kindly responded to the Society's appeal by giving them Rs. 7,500, which was very acceptable but would unfortunately not permit the Society to bring out a third collector, a very desirable course if the Survey was not to drag on for the next five years.

EXHIBITS.

Mr. Kinnear exhibited the specimen of mammals which had been named and returned by the British Museum.

The Secretary exhibited the following flowering plants new to Bombay :—*Mussænda erythrophylla* from Central Africa with bright crimson bracts (in contrast to the white bracts of the indigenous *M. frondosa*), *Solanum pensile* with violet and yellow flowers and *Odontodenia harrisi* with large pale yellow flowers and a salmon centre.

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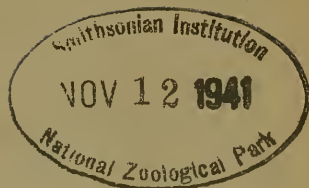
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Contributors; Errata and Addenda; List of Office-
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Bombay Government, The Chief Secretary,	Separate Department
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Boxwell, F.	London.
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Boyd, Capt. J. E. M. (R.A.M.C.)	Ferozepore.
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Currey, Capt. V. F.	Europe.
Curror, John	S. Sylhet.
Cursetji, Khan Bahadur C. M. (<i>Life Member</i>)	Bombay.
Cutch, H. H. Sir Shri Kengurji Sawai Bahadoor, the Rao Saheb of (G.C.I.E.) (<i>Life Member</i>)	Bhuji, Cutch.
D'Abreu, E. A.	Nagpur.
D'Albedyhll, C. C.	Europe.
Dalgliesh, G.	Europe.
Dallaporta, J. N.	Bombay.
Dalrymple-Hay, Mrs. L.	Trichinopoly.
Daly, The Hon'ble Col. Sir Hugh (K.C.I.E., C.S.I.)	Mysore.
Daly College, The Librarian	Indore, C. I.
Dames, Felix L.	Germany.
Daniell, Col. A. C. (R.A.)	Europe.
Danson, J. W. W.	Europe.
Darjeeling, The Vice-President, Natural History Museum	Darjeeling.
Dastur, J. F.	Pusa, Bengal.
Datia, H. H. the Maharaja Lokendra Govind Singh, Bahadur	Datia, C. I.
Daukes, Capt C. T.	Kashmir.
Davidson, J.	Europe.
Davidson, Major J. (I.M.S., D.S.O.) (<i>Life Member</i>)	Dehra Dun.

Davidson-Houston, Major C. E. D.	...	...	Quetta.
Davidson, Norman	...	...	Thazi, Burma.
Davidson, H. M. M.	...	...	Behali P. O. Assam
Davies, H. J. (F.G.S.)	...	...	Burma.
Davison, A.	...	...	Raipur.
Dawkins, C. G. E. (I.F.S.)	...	...	Pyinmana, Burma.
Dawson, W. G.	...	...	Europe.
Dawson, W. H. (I.C.S.) (<i>Life Member</i>)	...	...	Europe.
Deakin, Mrs. M. E.	...	...	Bombay.
Deane, Dr. A. H.	...	...	Bombay.
Deane, H. H. (C.E.)	...	...	Bombay.
Deane, N. B.	...	...	Rangoon.
De Carteret, St. G.	...	...	Etah, U. P.
DeCruz, A. M.	...	...	Bombay.
DeRhe-Philipe, G. W. V. F.E.S.	...	...	Bombay.
DeSouza, A. B.	...	...	Karwar.
Delmé-Radcliffe, Capt. A.	...	...	Poona.
Delmé-Radcliffe, Lt.-Col. H.	Quetta.
Delany, M. F.	Bombay.
Dempster, Lieut. G. H.	Rawalpindi.
Denso, W.	Bombay.
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Devas, A. E.	Europe.
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Dewar, F. (I.C.S.)	Balaghat, C. P.
Dewes, Lt.-Col. F. J. (I.M.S.)	Myingyan.
Dhar, H. H. The Raja of (K.C.S.I.) (<i>Life Member</i>)	Dhar, C. I.
Dharamdas Tribhuvandas Varjivandas, Sir	...	...	Bombay.
Dhunjbhoy Bomanji (<i>Life Member</i>)	Bombay.
Director of Agriculture, Bombay	Poona.
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Director of Land Records & Agriculture, E. B.	Shillong.
& Assam	Sibi, Baluchistan.
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Dixit, D. L. (B.A.)	Quetta.
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Dobbs, W. E. J. (I.C.S.)	Dhulia.
Dodgson, J. (I.F.S.)	Sialkote.
Dodgson, R. C.	Simla.
Dodsworth, P. T. L. (F.Z.S. F.S.S., M.B.O.U.)	Bangalore.
Donaghey, J. O. B.	...	...	Rangoon.
Donald, C. D.	...	...	Simla.
Donald, C. H.	...	...	Dehra Dun.
Donald, J. (I.F.S.)	...	...	Dharamsala Punjab.
Donaldson, Lionel	...	...	Madras.
Donovan, Lt.-Col. C. (I.M.S.)	...	...	Schwan Sind.
Dow, H. (I.C.S.)	...	...	Bezawada.
Dowlay, F. M.	...	...

Downing, A. K. Weld	...	...	... Coonoor, Nilgiris.
Doyle, James	...	...	... Balaghat, C. P.
Dracott, C. H.	...	...	... Gangtok
Drake-Brockman, Major D. H.	...	...	... Lansdowne, Garhwal, U. P.
Drake-Brockman, D. L. (I.C.S.)	...	...	... Jhansi, U. P.
Drake-Brockman, E. G. (I.C.S.)	..	...	... Bhagalpur.
Drake-Brockman, Lt.-Col. H. E. (I.M.S., F.Z.S.)	...	...	... Bombay.
<i>(Life Member)</i>			
Drake-Brockman, Maj. V. G. (I.M.S.)	...	...	... Dera Ismail Khan.
Dreckmann, Rev. F. (S.J.)	...	...	... Bombay.
Drummond, J. R. (B.A., F.L.S.)	...	...	... Europe.
DuBoulay, The Hon'ble Sir J. H. (I.C.S., K.C.I.E.)	...	...	... Delhi.
Dubash, K. D.	...	...	... Bombay.
Duff, A. C. (I.C.S.)	...	...	... Mercara, Coorg.
Duke, A. H.	...	...	... Siam.
Duggan, E. M.	...	...	... Karachi.
Dumayne, Sir F. G.	...	...	... Calcutta.
Dunbar-Brander, A. A. (I.F.S.)	...	...	... Nagpur.
Dunlop, Hon'ble Mr. R. W. L. (C.I.E.)	...	...	... Bombay.
Dunn, C. W. (I.C.S.)	...	...	... Rangoon.
Dunsterville, Col. K. S. (R.A.)	...	...	... <i>Europe.</i>
Dunsterville, Lt.-Col. L. C.	...	...	... Srinagar.
Durant, J. L.	...	...	... Hasimara.
Durie, G. A.	...	...	... Rangoon, Burma.
Durie, T. E. (R.F.A.)	...	...	... Cawnpore.
Duxbury, Capt. C. D. (<i>Life Member</i>)	...	...	... Mhow.
Dwane, E. H.	...	...	... Secunderabad.
Dwane, F. C.	...	...	... Deccan.
Dwane, H. M.	...	...	... <i>Europe.</i>
Dwane, Major J. W.	...	...	... <i>Europe.</i>
Dyer, Lt.-Col. R. E.	...	...	... Multan.
Dyson, Lieut.-Col. T. E. (I.M.S.)	...	...	... Poona.
Eccles, P. (I.C.S.)	...	...	... Bombay.
Economic Botanist to Government, U. P.	...	...	... Cawnpore.
Ede, F. J. (A.M.I.C.E.)	...	...	... Silchar, Cachar.
Edwards, W. N.	...	...	... Majuligarh, Assam.
Egerton, B. (C.I.E.)	...	...	... Hyderabad, Deccan.
Elgee, Major J. W. L.	...	...	... Aden.
Elliot, Capt. C. H.	...	...	... <i>Europe.</i>
Elliott, A. (C.I.E.)	...	...	... <i>Europe.</i>
Elliott-Lockart, Major P. C.	...	...	... Mardan.
Elliott, R. E. A. (I.C.S.)	...	...	... Bombay.
Elliott, Lt.-Col. R. H. (I.M.S.)	...	...	... Madras.
Ellis, E. V. (I.F.S.)	...	...	... Tharrawaddy.
Ellis, R. H. (I.C.S.) Mercara, Coorg.
Ellis, S. F. <i>Europe.</i>

Elwes, G. F. W. Siam.
Elwes, H. J. (F.R.S.) <i>Europe</i> .
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Enthoven, The Hon'ble Mr. R. E. (I.C.S., C.I.E.) Delhi.
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Evans, Geoffrey (B.A.) Hoshangabad, C.P.
Evans, Lt.-Col. G. H. (I.C.V.D., F.L.S., C.I.E.) Rangcon.
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Evans, T. M. Bombay.
Evans, Lt. T. W. D. Rawalpindi.
Evans, Capt. W. H. (R.E.) Simla.
Evans, Capt. W. K. Jullunder
Everard, L. C. E. ...	...	...	... Mongnai, S. Shan States.
Evershed, John ...	...	...	... Kodaikanal.
Fagan, Capt. B. ...	...	...	... Imphal, Manipur.
Fagan, H. R. ...	...	...	... <i>Europe</i> .
Fairbank, Rev. H. ...	...	...	... Ahmednagar.
Falkiner, Dr. J. M. ...	...	...	... <i>Europe</i> .
Farmer, E. J. (I.C.S.) ...	...	...	... Lashio.
Farr, E. T. C. ...	...	...	... Ceylon.
Farrel, R. C. (I.F.S.) ...	...	...	... Aurangabad.
Farrington, Sir H. A., Bart. (I.F.S.) ...	...	...	... Kurseong.
Fatehsingrao of Akalkote, H. H. Raja ...	...	...	... Kirkee.
Fawcett, E. B. ...	...	...	... Port Blair.
Fayrer, Major F. D. S. (I.M.S.) ...	...	...	... Bombay.
Fendall, C. E. ...	...	...	... Bussahir State, Simla District.
Fenton, Col. L. L. ...	...	...	... <i>Europe</i>
Fenton, Capt. L. S. ...	...	...	... Deesa.
Ferrar, Capt. M. L. (I.A.) ...	...	...	... Kulu.
Ferry, E. ...	...	...	... Benares.
Field, Frank ...	...	...	... Hardoi U. P.
Field, W. P. ...	...	...	... Jalpaiguri.
Filson, J. T. W. ...	...	...	... <i>Europe</i> .
Finlay, C. Kirkman ...	...	...	... Rangoon.
Firth, L. B. ...	...	...	... Calicut.
Fischer, C. E. C. (I.F.S.) ...	...	...	... Coimbatore.
Fisher, W. D. (I.F.S.) ...	...	...	... Bandra.
Fitz-Gerald, H. G. ...	...	...	... Rawalpindi.
Fitz-Gerald, Capt. O. A. G. ...	...	...	... Queita.
Fitz-Gibbon, Lt. F. (R.A.) ...	...	...	... Jubbulpore.
Fitz-Gibbon, P. J. C.E. ...	...	...	... Poona.
Fleming, Major A. M. (I.M.S.) ...	...	...	... Raipur.
Fletcher, T. Bainbrigge (F.E.S.) ...	...	...	... Coimbatore.
Florence, James ...	...	...	... Cawnpore.
Flower, Capt. S. S. ...	...	...	... <i>Egypt</i> .
Flyfishers' Club, The Secretary ...	...	...	... <i>Europe</i> .

Flynn, A. A.	...	...	...	... Karachi.
Forbes, Alister	...	...	...	... Bombay.
Forbes, Col. James	...	...	...	... Bombay.
Forbes-Sempill, The Hon'ble R. A.	...	...	...	... Europe.
Forster, T. W. (B.F.S.)	...	...	...	... Tharra waddy.
Forsyth, Dr. W.	...	...	...	... Europe.
Foster, R. Guy	...	...	...	... Sallebile P. O., Kadur District.
Foster, Capt. R. T.	...	...	...	... Europe.
Foulkes, George F. F. (I.F.S.)	...	...	...	... Ma n a n t o d d y , Malabar.
Foulkes, R.	...	...	...	... Madura.
Foulkes, Major T. H. (I.M.S.) (<i>Life Member</i>)	...	...	...	... Madras.
Fountaine, Miss M. E. (F.E.S.)	...	...	...	... Europe.
Fowle, F. C.	...	...	...	... Bengal.
Fowler, H.	...	...	...	... New York, U.S.A.
Fox, J. H. Manning	...	...	...	... Barrackpore.
Francis, R. F.	...	...	...	... Jullundur.
Fraser, D.	...	...	...	... Bombay.
Fraser, D. de M. S.	...	...	...	... Shiraz, P e r s i a n Gulf.
Fraser, Capt. F. C. (I.M.S., M.D., F.L.E.S.)	...	...	...	... Europe.
Fraser, Prof. J. N.	...	...	...	... Bombay.
Fraser, J. S.	...	...	...	... Madras.
Fraser, The Hon'ble Mr. S. M. (I.C.S., C.I.E.)	...	...	...	... Bombay.
Fraser, S. G. G.	...	...	...	... Bangalore.
Fraser, W. S.	...	...	...	... Ajmer, Rajputana.
Frederick, Capt. E. B.	...	...	...	... Europe.
Frere, Capt. A. G.	...	...	...	... Madras.
Friedlander, F. L.	...	...	...	... Insein.
Friedlander and Sohn, Messrs. R.	...	...	...	... Europe.
Frizelle, Major J.	...	...	...	... Europe.
Fry, John T.	...	...	...	... Bombay.
Fulton, Major H. T. (D.S.O.) (<i>Life Member</i>)	...	...	...	... Dehra Dun.
Fyson, Prof. P. F.	...	...	...	... Madras.
Gairdner, K. G.	...	...	...	... Bangkok.
Gale, A. C.	...	...	...	... Dharwar.
Gale, Capt. B. (I.M.S.)	...	...	...	... Peshawar.
Gale, Major E. S.	...	...	...	... Maymyo.
Gales, R. R.	...	...	...	... Calcutta.
Gallie, H. H.	...	...	...	... Moulmein.
Gammie, Prof. G. A. (<i>Life Member</i>)	...	...	...	... Kirkee.
Garbett, C. C. (I.C.S.)	...	...	...	... Lahore.
Gardyne, Major A. D. G.	...	...	...	... Cairo.
Garrett, H. B. G. (I.F.S.)	...	...	...	... Bangkok.
Garrett, R. S.	...	...	...	... Mhow.

Gaye, W. C.	...	...	... Secunderabad.
Gatherer, Capt. R. G. T.	...	...	... Bhamo, Burma.
Gauhati Club, The Librarian	...	...	... Ranhati.
Gebbie, F. St. J.	...	...	... Karachi.
George, C. P.	...	...	... Secunderabad.
Gerhardt, Paul	...	...	... <i>Europe</i> .
Gervers, Capt. F. R. S.	...	...	... Bombay.
Gharpurey, Capt. K. G. (I.M.S.)	...	...	... Bombay.
Ghosal, J. (I.C.S.)	...	...	... Panch Mahals.
Giberne, H. D.	...	...	... Mandalay.
Gibson, A. J. (I. F. S.)	...	...	... Kotgarh, Simla Dist.
Gibson, E. C. (I.C.S.)	...	...	... Akola.
Gibson, R. E. (I.C.S.)	...	...	... Bombay.
Gibson, W. R. (F.R.C.S., L.R.C.P.)	...	...	... <i>Europe</i> .
Gilbert, C. C.	...	...	... Ceylon.
Gilbert, C. E. L. (I.F.S.)	...	...	... Nasik.
Gilbert, R. N.	...	...	... Dongri P. O.
Gilbert-Cooper, W. J. (I.F.S.)	...	...	... Kado, Moulmein
Giles, A. R.	...	...	... <i>Europe</i> .
Giles, G. W.	...	...	... Trichinopoly.
Gilchrist, G. W.	...	...	... Bombay.
Gill, Capt. C. A. (I.M.S.)	...	...	... Rawalpindi.
Gill, C. G.	...	...	... Amritsar.
Gill, H.	...	...	... Cachar.
Gillespie, Major R. S. (R.E.)	...	...	... Secunderabad.
Gillett, Capt. E. S. (A.B.D.)	...	...	... Saharanpur.
Gillies, Capt. F. G.	...	...	... Quetta.
Gillum, S. J.	...	...	... Calcutta.
Gimlette, Lt.-Col. G. H. D. (C.I.E., I.M.S.)	...	...	... <i>Europe</i> .
Gimlette, Dr. J. D.	...	...	... Kelantan, F. M. S.
Gimson, C. (I.C.S.)	...	...	... Gauhati.
Girard, George	...	...	... Calcutta.
Girvin, Lt.-Col. J. (R.A.M.C.)	...	...	... Ahmednagar.
Gladstone, H. S. (F.Z.S., F.R.S.E.)	...	...	... <i>Europe</i> .
Glascock, L. C. (M.V.O.)	...	...	... Lahore.
Glasson, J. W. (I.C.S.)	...	...	... Godaveri, Madras.
Gleadow, F. (F.R.M.S.)	...	...	... <i>Europe</i> .
Gloster, Capt. J. H. (I.M.S.)	...	...	... Bombay.
Godber, Rev. John	...	...	... Calcutta.
Godfrey, E. J. (B.Sc)	...	...	... Bangkok.
Godson, Capt. C. A. (I.M.S.)	...	...	... Dacca.
Goldsmith, Dr. B. K.	...	...	... Bombay.
Goldsmith, H. A.	...	...	... Bolarum, Deccan.
Goll, E. A.	...	...	... Bombay.
Gombert, Rev. F. (S.J.)	...	...	... Trichinopoly.
Gonsalves, A. F. (<i>Life Member</i>)	...	...	... Bandra. [States.
Gordon, D. M.	...	...	... Keng Tung, S. Shan

Gordon, K. L.	...	...	...	Ceylon.
Gordon, R. G. (I.C.S.)	...	...	...	<i>Europe.</i>
Gordon-Ralph, J. B.	...	...	...	<i>Europe.</i>
Gore, F. W.	...	...	...	Hoogrijhan, Assam.
Gore, Dr. S. N., L.M.S.	...	...	...	Agra.
Goss, E. H. A.	...	...	...	Rangoon.
Gough, Lt.-Col. C. H.	...	...	...	<i>Europe.</i>
Gough, Major H. (I.A.)	...	...	...	Quetta.
Gould, B. J. (I.C.S.)	...	...	...	Gyantse.
Gourju, P. E.	...	...	...	Berhampur.
Gover, A. A.	...	...	...	Bangalore.
Grafton-Wignall, J. D.	...	...	...	<i>Europe.</i>
Graham, A. K.	...	...	...	Bombay.
Graham, C. T.	...	...	...	Rangoon.
Graham, Capt. G. H. I.	...	...	...	Ajmer.
Graham, J. A.	...	...	...	Mergara, Coorg.
Graham, L. (I.C.S.)	...	...	...	Bombay.
Graham, R. J. D. (M.A.)	...	...	...	Nagpur, C. P.
Graham Roe, E. W.	...	...	...	<i>Europe.</i>
Graham, W. L.	...	...	...	Bombay.
Grant, F. A.	...	...	...	Bhamo, Burma.
Gravely, F. H.	...	...	...	Calcutta.
Gray, Chas.	...	...	...	Coonoor.
Gray, P. B.	...	...	...	<i>Europe.</i>
Greaves, H. R.	...	...	...	Bombay.
Greaves, S. E.	...	...	...	<i>Europe.</i>
Green, E. Ernest (F.E.S.)	...	...	...	<i>Europe.</i>
Green, James	...	...	...	<i>Europe.</i>
Green, Lt.-Col. J. S. (R.A.M.C.)	...	...	...	Bangalore.
Greener, W. J.	...	...	...	Charanpur.
Greer, Major F. A.	...	...	...	Quetta.
Greer, R. F. (I.C.S.)	...	...	...	Rangoon.
Greer, W. (I.C.S.)	...	...	...	<i>Europe.</i>
Gregory, R. V.	...	...	...	Purna, Deccan.
Gregson, Capt. C. D.	...	...	...	Bangalore.
Gregson, E. G. (C.I.E.)	...	...	...	Peshawar.
Gregson, T. S.	...	...	...	Bombay.
Greig, Major W. B.	...	...	...	Nowshera.
Grey, W. A. P.	...	...	...	Burma.
Gribbon, M. C.	...	...	...	Quetta.
Grigson, P. St. J. B.	...	...	...	Rangoon.
Grieve, F. C. L. (R.H.A.)	...	...	...	Mhow, C. I.
Grönvold, H.	...	...	...	<i>Europe.</i>
Gross, Carl	...	...	...	Rangoon.
Grubbe, Major E. A.	...	...	...	<i>Europe.</i>
Gupta, B. Sen	...	...	...	Fakiragram, Dhubri
Gupta, Basat Lal (B. Sc.)	...	...	...	Lucknow.
Gurdon, Lt.-Col. B. E. M.	...	...	...	Dhar, C. I.

Gut, J. ... ..	... Andheri.
Gwyer, C. (I.F.S.) ... ..	... Thayetmyo.
Habibuddin, S. (N.C.S.) (<i>Life Member</i>) ... ..	... Hyderabad, Deccan.
Hacker, K. ... ..	... Europe.
Haeberle, Curt. (I.F.S.) ... ..	... Europe.
Haffenden, Ed. D. H. ... ..	... Rangoon.
Haig, Major N. W. ... ..	... Muttra.
Haigh, P. B. (I.C.S.) ... ..	... Europe.
Hale, Lt.-Col. C. H. (R.A.M.C.) ... ..	... Kamptee, C. P.
Haldane, C. H. ... ..	... Mandalay.
Hall, W. D. ... ..	... Bombay.
Hallaner, Martin ... ..	... Bombay.
Hamburg Natural History Museum ... ..	... Hamburg.
Hamer, Thruston ... ..	... Ceylon.
Hamid, A. Ali ... ..	... Hyderabad, Sind.
Hamilton, A. G. ... ..	... Europe.
Hamilton, J. D. (B.F.S.) ... ..	... Sandoway.
Hammond, A. H. ... ..	... Europe.
Hampson, Sir George F., Bart. (F.L.S., F.E.S.) ... ..	... Europe.
Hankin, A. C. (C.S.I., C.I.E.) ... ..	... Secunderabad.
Hanhart, S. ... ..	... Bombay.
Hankin, Dr. E. H. ... ..	... Calcutta.
Hannay, A. L. (I.C.S.) ... ..	... Waltair.
Hannington, F. (I.C.S.) ... ..	... Mercara.
Hannington, W. O. ... ..	... Shwabo, Burma.
Harcourt, Major J. S. M. ... ..	... Dehra Dun.
Hardie, Dr. Geo. W. ... ..	... Big Canjeeveram, S. India.
Hardy, G. S. (I.C.S.) ... ..	... Bombay.
Harington, Major H. H. ... ..	... Europe.
Harington, Col. V. (I.M.S.) ... ..	... Europe.
Harker, O. Allen ... ..	... Sholapur.
Harman, S. H. ... ..	... Tavoy.
Harold, Major C. F. ... ..	... Wadhwan.
Harper, E. W. (F.Z.S.) ... ..	... Africa.
Harris, H. R. ... ..	... Bombay.
Harris, Capt. O. M. (R.H.A.) ... ..	... Trimulgherry.
Harris, W. ... ..	... Gauhati.
Harrison, A. J. ... ..	... Lakhimpur, Assam.
Harrison, Major G. B. (I.M.S.) ... ..	... Europe.
Harrison, Major C. F. ... ..	... Tavoy.
Harrison, C. H. (I.C.S.) ... ..	... Nilgiris.
Harrison, R. T. (A.M.I.C.E.) ... ..	... Nasik.
Harrold, W. ... ..	... Abu Road.
Hart, E. H. ... ..	... Europe.
Hart, G. S. (C.I.E.) ... ..	... Nagpur, C. P.
Harter, R. W. ... ..	... Bombay.
Hartshorne, J. F. B. (I.C.S.) ... ..	... Kaira.

Harvey, Capt. W. F. (I.M.S.)	...	...	Kasauli.
Haslam, R. E.	...	...	Travancore.
Hasted, H. R. G.	...	...	Chittoor.
Hasted, W. A.	...	...	Tinnewelly.
Hassels-Yates, Capt. G. A. (R.G.A.)	...	...	Egypt.
Hatchell, D. G.	...	...	Europe.
Hate, Prof. Vinayek N.	...	...	Bombay.
Haughton, Cap. H. L.	...	...	Europe.
Hauxwell, T. A. (I.F.S.)	...	...	Maymyo.
Hawley, Capt. W. G. B.	...	...	Multan.
Hay, E. Alan	...	...	Europe.
Hay, E. F. A.	...	...	Pyinmana.
Hay, Capt. G. W.	...	...	Europe.
Hayden, H. H. (C.I.E.)	...	...	Calcutta.
Hazlewood, Miss M.	...	...	Rangoon.
Hearn, E. S.	...	...	Meerut.
Headlam, Lt. E. James (R.I.M.)	...	...	Bahrein, P. Gulf.
Hearsey, C. H.	...	...	Burma.
Hearsey, T. N. (I.F.S.)	...	...	Pollikonda.
Heath, H. A.	...	...	Horawala, Ceylon.
Heath, R. H. (C.E.)	...	...	Ahmedabad.
Hector, G. P. (M.A., B.SC.)	...	...	Dacca.
Heeckerenz, Baron Von (<i>Hon. Corres. Member</i>)	...	...	Europe.
Hemans, Capt. G. W.	...	...	Bolarum, Deccan.
Henderson, Capt. H. D.	...	...	Imphal, Manipur.
Henderson, Capt. R. R.	...	...	Europe.
Henderson, G. S.	...	...	Mirpurkhas, Sind.
Henderson, W. L.	...	...	Rangoon.
Hepburn, W.	...	...	Rangoon.
Herbert, H. P.	...	...	Trevandrum.
Herbert, V. A.	...	...	Almora.
Heron, F. A.	...	...	Punjab.
Heseltine, Capt. G....	...	...	Europe.
Heseltine, Capt. J. E. N.	...	...	Jubbulpore, C. P.
Hewetson, Major A. W. (R.F.A.)	...	...	Dinapore.
Heygate, Col. R. H. G. (D.S.O.)	...	...	Europe.
Richens, G. W.	...	...	Rangoon.
Hickman, R. St. J.	...	...	Cachar.
Hickey, B. S.	...	...	Champaran.
Hide, P. (<i>Life Member</i>)	...	...	Indore.
Higgins, H. A.	...	...	Hatikhira Sylhet.
Higgins, J. C. (I.C.S.)	...	...	Imphal, Manipur
Higginson, G. R.	...	...	Lucknow.
Hignell, S. R. (I.C.S.)	...	...	Purulia.
Hiley, A. C. (I.F.S.)	...	...	Belgaum.
Hill, Rev. E. E. (M.A.)	...	...	Bombay.
Hill, Hon'ble Mr. Claude H. (I.C.S., C.I.E., C.S.I.)	...	...	Bombay.
Hill, E. W.	...	...	Mandalay.

Hill, Capt. R. D. O. (<i>Life Member</i>)	...	...	Chitral.
Hingston, R. W. (I.M.S.)	...	...	Bombay.
Hitchcock, R. H.	...	...	Salem.
Hoare, H. J. (I.C.S.)	...	...	Europe.
Hobart, R. C. (I.C.S.)	...	...	Gorakhpur.
Hobson, L. C.	...	...	Dharwar.
Hodgson, Capt. M. R. K.	...	...	Jubbulpore.
Hodgson, Hon'ble Mr. H. P.	...	...	Europe.
Hojel, Lt.-Col. J. G. (I.M.S.)	...	...	Bombay.
Holberton, N. V. (I.F.S.)	...	...	Rangoon.
Holden, Major H. N.	...	...	Jaipur.
Hole, R. S. (I.F.S.)	...	...	Bombay.
Holkar, H. H. the Maharaja	Tukuji Rao (<i>Life Member</i>)	...	Indore, C. I.
Holland, Dr. H. T. (C.M.S.)	...	...	Quetta.
Holland, L. B.	...	...	Lahore, Punjab.
Holme, A. T. (I.C.S.)	...	...	Ajmer.
Holme, H. B. (I.C.S.)	...	...	Simla.
Holmes, H. R.	...	...	Kamptee, C. P.
Hood, A. F.	...	...	Mogok, Burma.
Homfray, Jeston	...	...	Assam.
Hoosein Belgrami, The Hon'ble	Mr. Syed Nawab	...	Hyderabad, Deccan.
Imud-ul-Mulk Bahadoor (C.S.I.)	...	...	Taunggyi, Burma.
Hope, A. J. R.	...	...	Mandalay, Burma.
Hopwood, J. C.	...	...	Maymyo, U. Burma.
Hopwood, S. F. (I.F.S.)	...	...	Secunderabad.
Hosken, A. Fayrer	...	...	Purulia, Bengal.
Hoste, R. D.	...	...	Larkana.
Hotson, J. E. B. (I.C.S.)	...	...	China.
Howell, E. B.	...	...	Lahore.
Howell, G. C. (I.C.S.)	...	...	Agra.
Howlett, Capt. A. W. (I.M.S.)	...	...	Pusa.
Howlett, F. M. (M.A., F.E.S.)	...	...	Dharwar.
Hudson, Lt.-Col. C. T. (I.M.S.)	...	...	Bangalore.
Hudson, Major C.	...	...	Bombay.
Hudson, C. W. M. (I.C.S.)	...	...	Europe.
Hudson, Major J. H.	...	...	Rangoon.
Hudson, Capt. P.	...	...	Jalna, Deccan.
Hudson, E. H. (A.M.I.C.E.)	...	...	Madras.
Huggins, J. R.	...	...	Waziristan.
Hughes, Capt. F. L.	...	...	Europe.
Hughes, T. O.	...	...	Munnar, S. India.
Hughes, E. A.	...	...	Muttra.
Hulbert, Major J. G. (I.M.S.)	Gangapur.
Hulton, W. P.	Dharwar.
Hume, H. R. (D.S.P.)	Bombay.
Humphrys, Capt. F. H.	Mepole.
Hundley, G.	

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Taskar, T. J. (I.C.S.)	Hospet.
Tata, Sir Dorabji J. (<i>Life Member</i>)	Europe.
Tata, Ratan (<i>Life Member</i>)	Bombay.
Taylor, Capt., E. C. (I.M.S.)	...	...	...	Parachinar.
Taylor, Capt. J.	...	...	...	Europe.
Taylor, James H.	...	...	...	Europe.
Taylor, L. E., A.M. I.C.E.	...	...	...	Dharwar.
Taylor, H. W. O. (B.Sc., A.M.I.C.E.)	...	...	...	Satara.
Tejpal, Goverdhandas Goculdas (<i>Life Member</i>)	...	...	...	Bombay.
Tenison, Lt. W. P. C. (R.F.A.)	...	...	...	Europe.
Tennant, G. F. D.	...	...	...	Bombay.
Tew, G. C. (I.C.S.)	...	...	...	Pyinmana.
Thom, W. S.	...	...	...	Paletwa, Aracan Hill Tracts.
Thomas, E. F. (I.C.S.)	...	...	...	Madras.
Thomas, M. P.	...	...	...	Chandpur.
Thomasset, H. P.	...	...	...	Seychelles.
Thomason College, The Principal	...	...	...	Roorkee.
Thompson, Miss A.	...	...	...	Betul, C. P.
Thomson, Major D. B.	...	...	...	Europe.
Thomson, Lt.-Col. Henry (I.M.S.)	...	...	...	Calcutta.
Thomson, F. P.	...	...	...	Shwegyin.
Thompson, R. H. E. (I.F.S.)	...	...	...	Europe.
Thompson, Major W. G. (R.H.A.)	...	...	...	Europe.
Thomson, Capt. W. M. (I.M.S.)	...	...	...	Chaubattia, U. P.
Thornhill, Lt.-Col. Sir H. B. (K.C.I.E.)	...	...	...	Dehra Dun.
Thornton, Capt. F. E.	...	...	...	Europe.
Thornton, H. A. (I.C.S.)	...	...	...	Lashio, Shan States
Thorpe, Capt. L. L. G. (R.A.M.C.)	...	...	...	Europe.
Thring, Lt.-Col. R. H. D.	...	...	...	Jubbulpore.
Thruston, L. A.	...	...	...	Mandalay.
Thubron, J. B. S.	...	...	...	Aden.
Thuillier, Major H. F. (R.E.)	...	...	...	Ahmednagar.
Thullier, Capt. L. C. (I.A)	...	...	...	Bombay.
Thurn, Count	...	...	...	Bombay.
Tibbs, Rev. P. G.	...	...	...	Bombay.
Tilly, T. H. (<i>Life Member</i>)	...	...	...	Canada.
Tinley, Col. G. F. N.	...	...	...	Europe.
Tipper, G. H. (B.A.)	...	...	...	Calcutta.
Tipping, P. G.	...	...	...	Sidapur, Goorg.
Tod, Alex. M.	...	...	...	Bombay.
Tomkins, Major E. L. (R.A.)	...	...	...	Jubbulpore.
Tomlinson, Capt. W. Paget, 7th Hussars	...	...	...	Bangalore.
Toppin, S. M. (R. A.)	...	...	...	Bhamo, Burma.

Tottenham, W. F. L. (I.F.S.)	...	...	.. Pokokku, Burma.
Townsend, Lt.-Col. E. C.	...	...	... <i>Europe</i> .
Trall, W. H.	...	...	... Jhansi.
Travancore, H. H. The Maharaja Sir Sultan Rama Raja Bahadoor (G.C.S.I., G.C.I.E.) (<i>Life Member</i>)	...	...	... Trivandrum.
Travers, W. L.	...	...	... Jalpaiguri.
Treeby, H. F.	...	...	... Ambala.
Trench, C. G. C. (I.C.S.)	...	...	... <i>Europe</i> .
Trevor, C. G. (I.F.S.)	...	...	... Kulu, Kangra Dist.
Trivandrum, The Director, Government Museum and Public Gardens	...	...	... Trivandrum.
Trotter, E. W.	...	...	... Bangkok, Siam.
Troup, N. F. T.	...	...	... Kousanie, Almora.
Troup, R. S. (I.F.S.)	...	...	... Dehra Dun.
Truninger, L.	...	...	... Calcutta.
Tunstall, A. C.	...	...	... Calcutta.
Turkhud, Dr. D. A.	...	...	... Bombay.
Turner, A. J. (B.Sc.)	...	...	... Bombay.
Turner, H. G.	...	...	... <i>Europe</i> .
Turner, Sir Montague	...	...	... <i>Europe</i> .
Tweedie, A. G.	...	...	... Calcutta.
Tweedie, Capt. J. L.	...	...	... <i>Cairo</i> .
Twiss, Capt. A. M. (R.E.)	...	...	... Kirkee.
Tyabji, S. B.	...	...	... Sholapur.
Tyler, H. H. F. M. (I.C.S.)	...	...	... Madras.
Tyrrell, Major J. R. (I.M.S.)	...	...	... <i>Europe</i> .
Tytler, Lt.-Col. H. C.	...	...	... Manipur.
United Service Club, The Secretary	...	...	... Bangalore.
United Service Library, Hon. Secretary	...	...	... Poona.
Unwalla, J. N. (<i>Life Member</i>)	...	...	... Bhavnagar.
Urwin, Capt. J. J.	...	...	... Motihari, B.-N. Ry.
U. S. Department of Agriculture, The Librarian	...	...	... <i>Washington D. C.</i>
Vakil, J. D.	...	...	... Bhavnagar.
Van Ingen, E. M.	...	...	... Mysore.
Varvill, M. N.	...	...	... Bombay.
Vaughan, W. (F.E.S.) (<i>Life Member</i>)	...	...	... <i>Europe</i> .
Venning, Capt. F. E. W. (<i>Life Member</i>)	...	...	... Pyawbwe, Burma.
Venour, Major W. E. (I.A.) (<i>Life Member</i>)	...	...	... Kohat.
Vernon, C. V. (I.C.S.)	...	...	... Karwar.
Vernon, H. A. B. (I.C.S.)	...	...	... <i>Europe</i> .
Victoria College, The Principal	...	...	... Palghat.
Victoria Technical Institute, The Curator and Librarian	...	...	... Nagpur.
Villar, A. R.	...	...	... Tharrawaddy.
Vincent, W. H. H. (I.C.S.)	...	...	... Calcutta.

Vijayarajji, Maharaj Kumar Shri	...	...	Bhuj, Cutch.
Vithuldas Damodhar Thakersey, The Hon'ble Sir...	...	...	Bombay.
Vlasto, P.	...	...	Bombay.
Volkart, L.	...	...	Bombay.
Waddington, T. H. (I.F.S.)	...	...	Europe.
Wainwright, F. M...	...	...	Gudivada, Kistna.
Waite, H. W.	...	...	Delhi.
Wakefield, G. C. E.	...	...	Hyderabad, Deccan.
Walker, J. S. E.	...	...	Motihari, Bengal.
Walker, Capt. W. B. (R.A.)	...	...	Kirkee.
Walker, Major W. R.	...	...	Cownpore.
Wall, Major F. (I.M.S., C.M.Z.S.)	...	...	Almora.
Wall, M. G.	...	...	Punjab.
Wallace, John (C.E.)	...	...	Bombay.
Wallace, R.	...	...	Bombay.
Wallace, Lt. R.	...	...	Satara.
Wallace, W. V. (I.C.S.)	...	...	Burma.
Wallinger, W. A.	...	...	Europe.
Walsh, E. P. (I.C.S.)	...	...	Rajahmundry.
Walsh, W.	...	...	Burma.
Walters, O. H.	...	...	Rawalpindi.
Walton, Major H. J. (I.M.S., C.M.Z.S.)	...	...	Bombay.
Warburton, A. P.	...	...	Kindat.
Warburton, H. G. (I.C.S.)	...	...	Lucknow.
Ward, Col. A. E.	...	...	Via Haldwani, R. and K. Ry.
Ward, Major C. H.	...	...	Colombo.
Ward, W.	...	...	Ootacamund.
Wardrop, Major A. E.	...	...	Meerut.
Ware, F.	...	...	Madras.
Warner, Granville Lee	...	...	Jubbulpore.
Wasey, G. K.	...	...	Europe.
Waterfield, E. H. (I.C.S.)	...	...	Poona.
Watney, Capt. C. W.	...	...	Peshawar.
Watson, Capt. H. R.	...	...	Bangalore.
Watson, H. W. A. (I.F.S.)	...	...	Mogok, Burma.
Watson, Major J. W. (I.M.S.)	...	...	Bharatpur.
Watson, W. M.	...	...	Europe.
Watts, Major G. A. R.	...	...	Quetta.
Watts, N. H. L.	...	...	Mandalay.
Way, J. D.	...	...	Vizagapatam.
Webb, G. R.	...	...	Europe.
Webb, M. (I.C.S.)	...	...	Hyderabad, Sind.
Webb, W. K.	...	...	Sonada.
Webb, J. E.	...	...	Calcutta.
Webster, J. R.	...	...	Bombay.
Webster, Lieut. D. (R.N.)	...	...	Europe.

Welchman, G. H. ...	...	...	... Ganjam.
Weldon, W. L. ...	...	...	... Bombay. [S. Ry.
Weller, A. O. ...	...	...	... Kanchrapara, E. B.
Wells, Capt. F. W. A. ...	...	...	... Toungoo, U. Burma.
Wells, Dr. H. E. (M.B.) ...	...	...	... Minbu.
Wells, Capt. R. T. (I.M.S.) ...	...	...	... Bombay.
Welman, P. H. ...	...	...	... Bombay.
Wenden, H. (C.E., C.I.E.) ...	...	...	... <i>Europe</i> .
Weston, A. T. ...	...	...	... Hminelongyee, L. Burma.
Weston, W. V. ...	...	...	... Sylhet.
Whalley, G. P. ...	...	...	... Saidpur.
Whately, Richard ...	...	...	... Bombay.
Wheatley, Major P. (R.F.A.) ...	...	...	... Mhow, C. I.
Whiffin, D. ...	...	...	... Panposh, B.-N. Ry.
Whistler, Hugh ...	...	...	... <i>Europe</i> .
White, Capt. A. W. ...	...	...	... Poona.
White, Colin R. ...	...	...	... Mandapam.
White, C. R. ...	...	...	... Shwebo, Burma.
White, Chas. W. ...	...	...	... Bombay.
White, C. A. ...	...	...	... Alipore.
White, W. T. ...	...	...	... Rangoon.
White, W. P. ...	...	...	... Bhandara, C. P.
Whitehead, Capt. C. H. T. ...	...	...	... Kohat.
Whitehead, John (I.F.S.) ...	...	...	... <i>Europe</i> .
Whitehead, Major J. H. ...	...	...	... Port Blair.
Whitehead, T. A. ...	...	...	... Cuddapah.
Whittall, Lieut. G. ...	...	...	... Malapuram.
Whittall, Brigade-Col. F. V. ...	...	...	... <i>Europe</i> .
Whitworth, G. C. (<i>Life Member</i>) ...	...	...	... <i>Europe</i> .
Whymper, S. L. ...	...	...	... <i>Europe</i> .
Wickham, H. C. ...	...	...	... <i>Europe</i> .
Wickham, P. F. (C.E.) ...	...	...	... Rangoon.
Wiles, G. (I.C.S.) ...	...	...	... Belgaum.
Wilks, J. S. ...	...	...	... Russelkonda.
Williams, E. Alban ...	...	...	... Bombay.
Williams, Major C. E. (I.M.S.) ...	...	...	... <i>Europe</i> .
Williams, J. K. ...	...	...	... Bijapur.
Williamson, A. (I.C.S.) ...	...	...	... Shwegyin.
Williamson, K. B. ...	...	...	... Jubbulpore, C. P.
Williamson, W. J. F. ...	...	...	... Bangkok, Siam.
Willis, R. A. ...	...	...	... Bombay.
Willock, Comdr. A. R. G. (R.I.M.) ...	...	...	... Akyab.
Wilson, Major Alban ...	...	...	... Shillong, Assam.
Wilson, A. R. ...	...	...	... Almora, U. P.
Wilson, P. R. ...	...	...	... <i>Europe</i> .
Wilson, A. T. ...	...	...	... Bushire.
Wilson, Johnstone J. (I.C.S.) ...	...	...	... <i>Europe</i> .

Wilson, C. C.	...	...	...	Coimbatore.
Wilson, Lt.-Col. C. H. L. F. (R.A.)	...	...	...	.. <i>Europe</i> .
Wilson, H. C.	...	...	...	... Madras.
Wilson, J. C. C.	...	...	...	... Papun, Burma.
Wilson, P. N. W.	...	...	...	... Jubulpore.
Wilson, R. A. (I.C.S.)	...	...	...	... Jubbulpore.
Wilson, William Burns	...	...	...	... <i>Europe</i> .
Wimbush, O. C. B.	...	...	...	... <i>Europe</i> .
Wimbush, A.	...	...	...	... Nilambar, Malabar.
Winter, G. B. (A.M.I.C.E.)	...	...	...	... Bombay.
Withinshaw, L.	...	...	...	... Ramnad.
Withers, D. S.	...	...	...	... Assam.
Witt, D. O. (I.F.S.)	...	...	...	... Saugor, C. P.
Wood, C. W. (C.E.)	...	...	...	... Madras.
Wood, Major H. (R. E.)	...	...	...	... Bombay.
Wood, Major H. S. (I.M.S.)	...	...	...	... Calcutta.
Wood, John A.	...	...	...	... Kelantan.
Wood, S. C. G.	...	...	...	... Bombay.
Woodhouse, E. J.	...	...	...	... Sabour.
Worgan, Capt. R. B.	...	...	...	... Madras.
Wright, A. J.	...	...	...	... Travancore.
Wright, Lt.-Col. E. H. (I.M.S.)	...	...	...	... Tanjore.
Wright, F. A. (C.E.)	...	...	...	... <i>Europe</i> .
Wright, H. C.	...	...	...	... <i>Europe</i> .
Wright, J. M. (I.C.S.)	...	...	...	... Shwebo, Burma.
Wright, Capt. W. D. (I.M.S.)	...	...	...	... Belgaum.
Wroughton, R. C. (F.Z.S.) (<i>Life Member</i>)	...	...	...	... Natal, S. Africa.
Wyndham, P. (I.C.S.)	...	...	...	... Mirzapur.
Yates, R. C. C.	...	...	...	... Madras.
Yeo, Edwin W.	...	...	...	... Bombay.
Yerbury, Col. J. W. (R.A.) (<i>Life Member</i>)	...	...	...	... <i>Europe</i> .
Younan, Lt.-Col. A. C. (I.M.S.)	...	...	...	... China.
Young, E. H.	...	...	...	... <i>Europe</i> .
Young, F. B.	...	...	...	... <i>Europe</i> .
Young, H. G.	...	...	...	... Lahore Cantt.
Young, J. V. (I.F.S.)	...	...	...	... Pyinmana, Burma.
Young, Capt. M. J. D.	...	...	...	... Rawalpindi.
Yule, Capt. R. A.	...	...	...	... <i>Europe</i> .

STATEMENT of ACCOUNTS from 1st January 1911 to 31st December 1911

Total Rs.	..	35,032 12 4	35,032 12 4
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We have seen a letter from the National Bank of India, Limited, to the effect that the above Securities were held on the Society's behalf on the 31st December 1911.

(Sd.) L. H. SAVILE,
Honorary Treasurer.

BOMBAY, 29th May 1912.

RECEIPTS.		Rs.	a.	p.	Rs.	a.	p.
BALANCE ON 31st DECEMBER 1910—							
Cash in the National Bank of India, Ltd...		2,729	13	0			
Cash on hand		145	5	0			
Balance per Petty Cash Book ..		38	14	2			
" " Postage Book ..		46	10	9			
		1,960	10	11			
Less—Cheque drawn in December 1910 but cash in January 1911 ..		125	0	0	2,835	10	11
Subscription for 1908 (in arrears)		15	0	0			
" " 1909 ..		190	0	0			
" " 1910 ..		331	9	0			
" " 1911 ..		18,910	9	9			
" " 1912 (in advance) ..		2,461	3	6			
" " 1913 ..		13	13	6			
" " for Life Membership ..		600	0	0	21,786	12	9
Entrance Fee ..		1,620	12	0			
Government of Bombay Grant-in-aid ..		5,000	0	0			
Subsidies ..		1,373	3	0			
Sale of Journals ..		1,472	12	6			
Sale of Duck Book ..		243	9	6			
Interest on Investments ..		1,607	9	2			
Interest allowed by the Bank ..		89	4	6			
		10,410	4	8			
		35,032	12	4			
Total Rs.					35,032	12	4

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of ACCOUNTS from 1st January 1912 to 31st December 1912.

RECEIPTS.		EXPENDITURE.		Rs. a. p.	Rs. a. p.
To BALANCE ON 31st DECEMBER 1911—		By Journal Account .. .. .	.. .. .	19,537 6 4	.. .. .
Cash with The National Bank of India	2,194 9 9	Salaries .. .. .	.. .. .	9,616 0 6	.. .. .
" " on hand	980 14 0	Rent of Room .. .. .	.. .. .	2,860 0 0	.. .. .
" " on hand	316 13 6	General Charges .. .. .	.. .. .	2,149 3 0	.. .. .
Balance per Petty Cash Book	43 4 6	Postage .. .. .	.. .. .	983 1 6	.. .. .
" " Postage Book	4 12 0	Printing and Stationery .. .. .	.. .. .	669 9 6	.. .. .
Subscription for 1909 (in arrears)	30 0 0	Library .. .. .	.. .. .	318 11 10	.. .. .
" " 1910 (")	360 0 0	Furniture .. .. .	.. .. .	416 11 0	.. .. .
" " 1911 (")	905 15 9	Sundries .. .. .	.. .. .	748 9 10	.. .. .
" " 1912	19,986 13 1	Bank Charges .. .. .	.. .. .	65 5 0	.. .. .
" " 1913 in advance	2,564 7 9	Insurance .. .. .	.. .. .	75 0 0	.. .. .
" " 1914	16 0 0				
" Life Memberships	1,000 0 0				
	24,843 4 7	By Balance—			37,439 10 6
Less—Refunded	60 4 0	Cash with The National Bank of India, Ltd .. .. .	.. .. .	2,214 3 6	.. .. .
Entrance Fee	1,950 0 0	Cash on hand .. .. .	.. .. .	847 8 5	.. .. .
Government of Bombay Grant-in-aid	5,000 0 0	Balance per Postage Book .. .. .	.. .. .	48 2 9	.. .. .
Sundries	784 12 11	Balance per Petty Cash Book .. .. .	.. .. .	10 7 4	.. .. .
Library	44 10 0				
Sale of Snake Books	187 8 0	By Securities—			
" " Journals	2,561 3 2	3% Government of India Pro. Notes .. .. .	.. .. .	Nominal Value.	
Interest on Investments	1,607 2 2	4% Bombay Port Trust Unguaranteed .. .. .	.. .. .	14,000 0 0	.. .. .
" allowed by Bank	101 5 11	Bond, .. .. .	.. .. .	14,000 0 0	.. .. .
		4% City of Bombay Improvement Trust .. .. .	.. .. .	15,000 0 0	.. .. .
		Bonds .. .. .	.. .. .	43,000 0 0	.. .. .
Total Rs.		Total Rs. .. .. .	.. .. .	30,560 0 6	.. .. .

We have seen a letter from the National Bank of India, Limited, to the effect that the above Securities were held on the Society's behalf on the 31st December 1912.

Examined and found correct.

(Sd.) L. H. SAVILE, (Sd.) A. F. FERGUSON & Co.,

Honorary Treasurer. Chartered Accountants and Auditors.

BOMBAY, 10th March 1913.

BOMBAY NATURAL HISTORY SOCIETY.

MAJIMAL FUND.

STATEMENT of ACCOUNTS from 1st January 1911 to 31st December 1911.

RECEIPTS.	Rs. a. p.	EXPENDITURE.	Rs. a. p.	Rs. a. p.
Donations received during the year	23,394 19 7	<i>Collecting Expenses</i> —		
Interest from the Bank	199 7 2	Mr. Crump's Salary	1,800 0 0	
" on Fixed Deposit	75 13 3	" Travelling Expenses	847 6 6	
		" Shortridge's Salary	298 13 3	
		" " Passage .. and .. incidental Charges	887 10 11	
		Ammunition, Collecting Boxes and Railway Charges, &c.	717 13 6	
		Camp Kit	951 6 2	
			5,483 2 4	
		<i>Less</i> —Amount recovered from Mr. Crump towards the cost of Gun	120 0 0	
		Printing and Stationery .. ..	.....	5,363 2 4
		General Charges .. ..	.....	596 6 8
		Postages .. ..	.....	409 4 9
			.....	210 11 0
		<i>Balance</i> —		
		Fixed Deposit with the National Bank of India, Limited	10,070 0 0	
		Cash in the National Bank of India, Limited. Advance to Mr. Shortridge for travelling expenses (to be accounted for)	5,743 2 0	
		Advance to Mr. Crump, for travelling expenses (to be accounted for)	922 6 0	
		Balance per Petty Cash Book	322 4 3	
		" " Postage Book	19 8 6	
			13 3 6	
			17,090 8	
			23,600 1 0	

(Sd.) L. H. SAVILE,
Honorary Treasurer.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants and Auditors.

BOMBAY, 29th May 1912.

BOMBAY NATURAL HISTORY SOCIETY.

MAMMAL FUND.

STATEMENT of ACCOUNTS from 1st January 1912 to 31st December 1912.

RECEIPTS.		EXPENDITURE.	
	Rs. a. p.		Rs. a. p.
BALANCE AT 31ST DECEMBER 1911.—			
Fixed Deposit with the National Bank of India, Ltd.	10,070 0 0	COLLECTING EXPENSES.—	
Cash in the National Bank of India, Ltd.	5,743 2 0	Mr. Crump's Salary	2,400 0 0
Advance to Mr. Shortridge	922 6 0	" " Allowance (while in Bombay)..	152 14 5
Advance to Mr. Crump	323 4 6	" " Travelling and Camp Expenses,	1,219 4 6
Balance per Petty Cash Book	19 8 6	Mr. Shortridge's Salary	3,900 0 0
Balance per Postage Book	13 3 6	" " Allowance	455 0 0
		" " Travelling & Camp Expenses,	2,122 7 11
		" " Kit	63 11 0
		" " Salaries and Expenses of the Staff ..	965 0 9
Donations received during the current year ..	11,541 0 2	Ammunition collecting boxes and collecting	1,045 1 0
Interest on Fixed Deposit	928 9 4	Camp kit	102 12 0
" " Current Account	18 0 10		
" " Sundries	28 14 4	Printing and Stationery	45 6 9
Cost of Gun recovered	80 0 0	General Charges	580 9 3
		Camera purchased	219 12 0
		Postage	101 11 9
		Sundry Expenses	231 6 2
		By Balance—	
		Fixed Deposit with the National Bank of	10,380 0 0
		India, Ltd.	
		Cash in the National Bank of India, Ltd.	4,333 13 3
		Advance to Mr. Shortridge (to be accounted	
		for)	475 0 0
		Advance to Mr. Crump (to be accounted for)..	300 0 0
		Balance per Postage Book	12 11 9
		Balance per Petty Cash Book	15 15 5
Total Rs. ..	29,183 9 11	Total Rs. ..	15,517 8 5
			29,183 9 11

Examined and found correct.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants and Auditors.

(Sd.) L. H. SAVILE,
Honorary Treasurer.

BOMBAY, 10th March 1913.

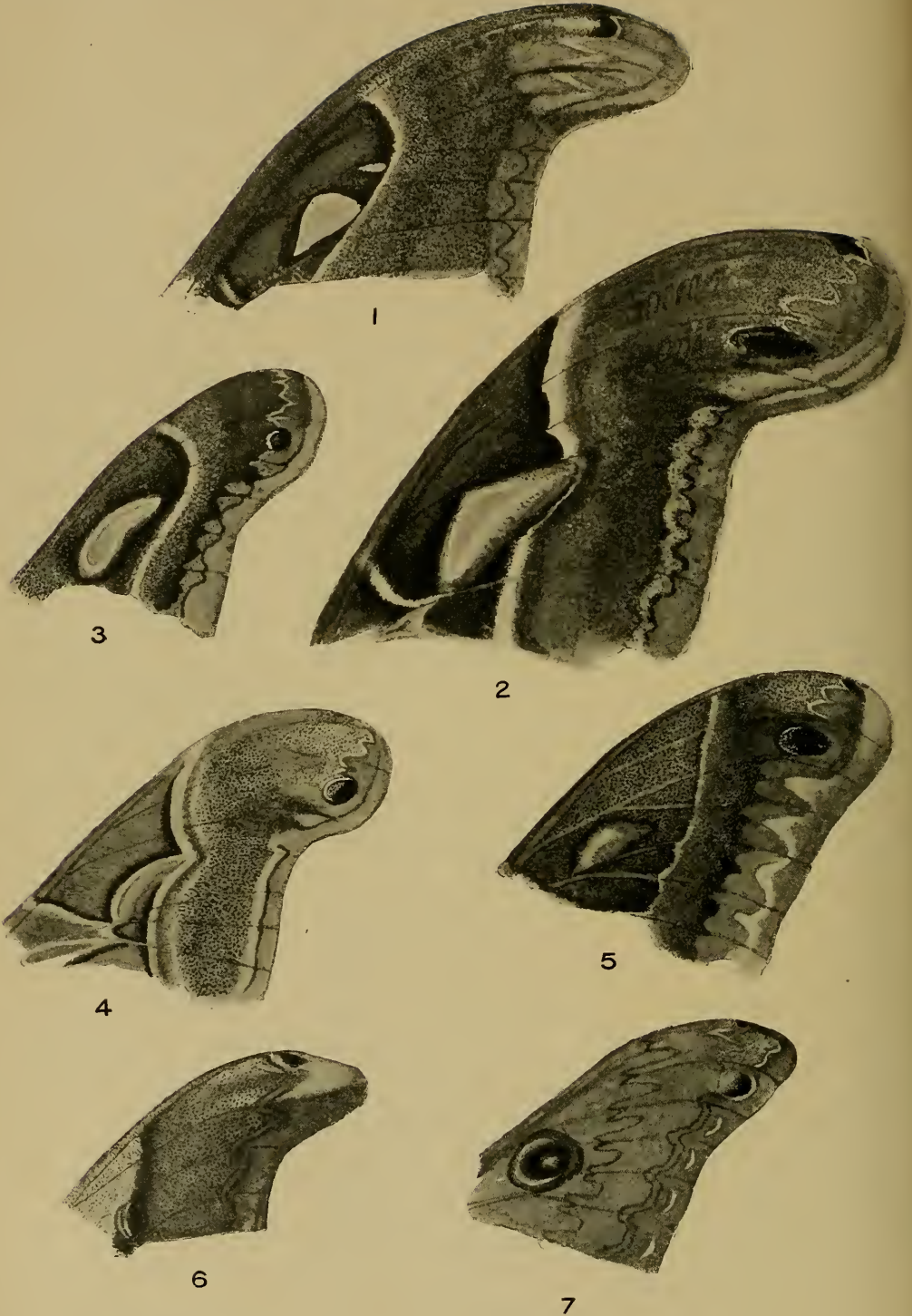


FIG. 1. Apex of forewing of *ATTACUS ATLAS* (Linn), from India.
2. Apex of forewing of *ATTACUS EDWARDSI* (White), from India.
3. Apex of forewing of *ATTACUS MITHYMNA* (Westwood), from Natal.

FIG. 4. Apex of forewing of *ATTACUS CYNTHIA* (Drury), from India.
5. Apex of forewing of *SAMIA GECROPIA* (Linn), from United States.
6. Apex of forewing of *SATURNIA SIMLA* (Westwood), from India.
FIG. 7. Apex of forewing of *LOEPA KATINKA* (Westwood), from Sumatra.

MIMICRY IN SILK-WORM MOTHS.

(With Plates I, II and III).

The phenomenon of Mimicry, as presented by Lepidoptera, affords a most fascinating study to those who go about the world with their eyes open—even though they may not happen to be students of entomology. For instance, what beginner at collecting has not been struck by the startling resemblance of the female of *Hypolimnas misippus* (Linn.), to the common *Danaüs chrysippus* (Linn.)? or by that of the moth *Epicopia rolydora* (Westw.) to the Papilios of the *Philoxenus* group?—just to mention two very self-evident instances. What is the meaning of it? and why should *D. chrysippus* be such an exceedingly common butterfly? are questions which suggest themselves to us at once. These are phenomena which are presented to us, and it is “up to” us to endeavour to account for them in some reasonable manner, and not to pass the problems by as insoluble. In endeavouring to account for them, however, one fundamental rule must not be lost sight of, which is that the imitator and its model must be or must recently have been inhabitants of the same locality, otherwise the whole theory of mimicry falls to the ground. As it happens, the solution of the apparent enigma referred to above is a simple one: the sub-family *Danainæ* to which *D. chrysippus* belongs have, as we all know, acquired the faculty of being distasteful to the many insectivorous birds and reptiles which prey upon, butterflies and moths, and so enjoy immunity from their attacks, and are consequently, numerous in individuals; and further, some of those forms, which do not possess this faculty, have gradually become developed in imitation of their more fortunate comrades, in accordance with the Darwinian Law of the survival of the fittest. The immunity of these specialized forms has probably been acquired as follows:—the larvæ of many of them are known to feed on *Aristolochia indica*, *Gomphocarpus fruticosus* and other Asclepiad plants which, when cut, exude a white milky substance which is exceedingly bitter to the taste, and the inference is that this quality is transmitted to the imagines and renders them distasteful. The *Philoxenus* group of *Papilio* is also protected by possessing, as imagines, a disgustingly rank odour, somewhat resembling musk, which is so strong and enduring that it remains even after the death of the insect.

Still the theory of protective imitation is a thorny subject to tackle, and it is with considerable diffidence that I write this paper dealing with another forms of mimicry as exemplified by forms of the family *Saturniidae* (or silkworm moths). Any observer who has studied the family must have been struck by the faithful representation of a snake's head, which appears on both sides of the apex of the forewing in the various forms of the genus *Attacus* and other allied genera of *Saturniidae*; in other words, the apex of the forewing of these forms appears to have been developed in imitation of the head of some snake: this phenomenon is apparent at once to anyone who places a piece of paper over a specimen in the cabinet, so as to cover up the whole insect from view except the apical half of the forewing.

I have figured the apices of the forewing of seven forms of *Saturniidae* in my collection, which exhibit this character with greater or less fidelity, the two most striking representations being undoubtedly *Attacus atlas* and *Attacus edwardsi*, the former of which exhibits the snake's head in profile and the latter gives a view of the head from above, showing both eyes: the remaining forms though, perhaps, not so striking, give, nevertheless, an accurate delineation of a serpent's head, and point to general tendency towards snake mimicry in this family in forms from the Ethiopian and Nearctic regions as well as the Oriental.

It may be objected that the colours of these moths are very different from those of the cobra and other snakes, but allowance should be made for the moths resting under the shade of leaves, as they would often be, during the sunny hours of the day, when the colours would not show up so brightly. In such circumstances, well marked colouration would be necessary to bring out the details when in deep shadow, and even the apex of the forewing of such a brightly coloured moth as *Loepa katinka* (Westw.) might be mistaken for the head of one of the smaller bright green snakes. In any case, the phenomenon is a most remarkable one, and I have not read as yet of any reasonable explanation of it; that there is a reason for it is as great a certainty as that there is a reason for the existence of everything in nature, in the economy of which all forms of life work out their allotted duties. Let us try, then, to see how we may reasonably account for it.

Being of large size, these moths are conspicuous objects, when resting, and some protection is necessary for the continuation of the species. There are in India 213 species of snakes of which some 33 are poisonous: the food of many of them consists of rats, mice and small birds,—a percentage of which are insectivorous: the toll of birds taken by these reptiles must be very considerable, and is said to be obtained by the exercise of a mysterious power termed 'fascination,' the victim being held, as it were, by the gaze of it's destroyer, and compelled to remain in the same spot until the serpent can approach sufficiently near to seize it. It is clear, therefore, that an insectivorous bird in pursuit of a moth amongst the leaves of a tree would be quickly brought to a standstill by the appearance of a snake's head just as it was about to seize it's prey.

Now an Atlas moth resting amongst the leaves of a tree (as shown in Plate No. I.), with the apices of the forewing projecting and giving the appearance of a snake's head, would, in my opinion, have a good chance of escape from any insectivorous bird, which suddenly came across it; and as the upper and underside of the wings representing the reptile are coloured in a similar manner, the result would be the same on whichever side it was approached.

Such appears to me to be the most likely explanation of the phenomenon. Some remarks in detail on the forms figured may now be given.

Fig. 1.—*Attacus atlas* Linn.—In this form a side view or profile of the snake's head is seen. The eye is represented by the black subapical spot, and the mouth by the crimson streak below it, while the dark markings with whitish edges and diaphanous spot in the centre of the wing would serve to represent the "hood" and "spectacles" of a cobra.

Fig. 2.—*Attacus edwardsi* White.—This form gives the most startling and sinister representation of a Serpent's head of any of the forms figured. The aspect presented is that which would appear to an observer looking down on it from above; the violet subapical patch would represent the shining surface of the top of the snake's head; the small black subcostal apical spot is the left eye, and the somewhat elongated oval black spot between veins 6 and 7 the right eye, while the mouth and lips are shown by the submarginal and marginal lines; as in fig. 1 the central markings serve to represent the "hood" and "spectacles."

Fig. 3.—*Attacus mithymna* (Westw.).—An African form representing a smaller species of snake viewed from above; the various details are well brought out in this form: central markings present, and give a fair representation of "hood" and "spectacles" of *Naja haje*, the African cobra.

Fig. 4.—*Attacus cynthia*, (Drury)—A form very similar to the last, but much lighter in colouration; snake's eye and mouth well delineated. This



Sketch of *ATTACUS ATLAS* resting on the branch of a tree, showing the protection obtained by the apices of forewings resembling serpents' heads.

form is curious in that, while the outlines indicate unmistakably a snake's head, the colouration does not appear to have been modified to an equal extent. Inhabits the Nearctic as well as the Oriental region.

Fig. 5.—*Samia cecropia* (Linn.).—An American form showing a similar aspect of a snake's head to the two last; both eyes are represented.

Fig. 6.—*Saturnia simla* (Westw.).—This form represents the snake's head as it would appear to an observer somewhat below it. Subcostal black spot representing eye, and pale subapical patch showing part of the snake's head above the line of the mouth. An interesting form as the hind wings appear to be somewhat modified, to represent an owl's head in certain positions. (Plate No. II).

Fig. 7.—*Loepa katinka* (Westw.).—This form is interesting in that it shows a marked tendency to snake imitation, even in a form in which the specific colouration does not lend itself to mimicry of this kind. Yet here we have the usual violet subapical patch referred to above, with a more or less developed black spot between veins 6 and 7, and the other eye indicated by a minute subapical costal spot.

It is somewhat difficult to imagine surroundings in which this form with its unusually vivid colouration could be mistaken for a snake, unless, when resting among similarly coloured leaves in deep shadow, it may resemble one of the smaller bright green snakes.

Another remarkable character in this family is the diaphanous spot in the centre of each wing: in the hindwing these are, in many forms, much enlarged and developed into conspicuous eye-like spots. These may be intended to afford protection by presenting the appearance of an owl's head when the moth is at rest amongst the leaves of a tree as suggested. (Plate No. II.). These spots are most beautifully developed in this direction on the hind wings of *Telea polyphemus*, Cramer, an American form. Of course, an owl's head would have an equally deterrent effect as that of a snake on a small insectivorous bird.

J. M. FAWCETT, COL.,
(late 5th Lancers).

ENGLAND, 1911.

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Sketch of *SATURNIA SIMLA* (*Westw.*), resting amongst leaves, showing the protection obtained by the hindwings resembling the head of an owl. Note also, the serpent's head at the apices of the forewing.

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<i>Hemixus flava</i>	1200	————— <i>orbifer</i>	1000
————— <i>maccllelandi</i>	1200	————— <i>phlomidis</i>	1000
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— (Byasa) adamsoni	970	— (—) — telearchus	970
— (—) crassipes	970	— (Iliades) mayo	970
— (—) dasarada	970	— (—) memmon agenor	972
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